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International Science News & INSA Delegation Reports

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EDITOR'S NOTE

INSA is committed to the growth of natural knowledge in India and its application to the problems of national welfare. Being the adhering body in India for the ICSU, the Academy is entrusted with deputing Indian delegations to various international conferences and symposia. Since its inception in 1935, INSA has endeavoured to promote the dissemination of scientific knowledge and matters concerning science policy and philosophy of science. The Fellows of the Academy have played a major role not only in practising science but in actively participating in professional meetings the world over.

Realizing that the three scientific journals being published by the Academy are primarily devoted to the communication of scientific research findings, a new quarterly journal has been started to cover international science news and present delegation reports to the Fellowship and to the Indian scientific community at large. The contents of the journal cover: (i) reports of General Assembly meetings of ICSU and other organizations; (ii) reports of INSA delegations sent abroad; (iii) brief accounts of individual scientists sponsored by INSA to attend conferences; (iv) highlights of international conferences in specialized areas of research; (v) experiences of scientists under Inter-Academy exchange programme; (vi) summaries of lectures delivered by distinguished scientists and (vii) excerpts of news-worthy items from leading international scientific journals.

Through this publication, the Academy aims to spread current developments in scientific knowledge and to ascertain view on values and judgements in science and technology.

It has been two years now since the idea of publishing the delegation reports was first conceived. We have been receiving objective reports of the delegates sponsored to various international conferences and symposia. Apart from reporting to the Academy about their individual contributions to a given conference, the delegates are expected to focus attention on its main theme as well as highlight the major conclusions for the benefit of the wider community. This will provide an overall picture of the conference to the interested reader and thus help in meeting the basic obligations of the journal.

The number of write-ups received by us in last two years was much more than could possibly have been included in this journal. In order to cover the maximum number of conferences/symposia, some of these reports are being included as short communications, and more such items are envisaged in the forthcoming issues. We also look forward to suggestions for improving the contents and scope of this journal.

A N Mitra

III INTERNATIONAL SYMPOSIUM ON WIDE-SPAN STRUCTURES : A REPORT*

Professor G S Ramaswamy attended the III International Symposium on Wide-Span Structures at the University of Stuttgart Federal Republic of Germany from March 18-22, 1985. This is the last of a series of three conferences organized by SFB-64 to review its achievements during the past 15 years and to set sights for future research to be undertaken in the area of wide-span structures.

Genesis, Objectives and Achievements of SFB — 64

The Sonderforschungsbereich 64 (SFB — 64) came into being in 1970 as a co-operative endeavour between the Research Institutes at the University of Stuttgart and DFG — the German Research Association (Deutsche Forschungs gemeinschaft) to undertake systematic research into special problems relating to all aspects of long-span construction materials, form-finding, stress-analysis and construction techniques. During the past fifteen years of its existence, the main thrust of SFB-64 research and developmental efforts has however been directed towards perfecting the techniques of analysis, design and construction of light tension structures for long spans. Its pioneering contributions in this area have been the result of in-depth interdisciplinary studies in which the following research institutes at the University of Stuttgart have participated.

- i) Institut für leichte Flächentragwerke (Institute for light structures) :
Director : Prof Dr Ing Frei Otto.
- ii) Institut für Modellstatik (Institute for Model Analysis)
Director : Prof Dr Ing Robert K Müller.
- iii) Institut für Massivbau (Institute for heavy construction)
Director : Prof Dr Ing Jorg Schlaich.
- iv) Institut für Computeranwendungen (Institute for Computer Applications)
Director : Prof Dr Ing John Argyris
- v) Institut für Werkstoffe im Bauwesen (Institute for Construction Materials)
Director : Prof Dr Ing Gallus Rehm

* Based on the delegation report of Professor G S Ramaswamy, FNA, E 119, 16th Cross Road, Besant Nagar, MADRAS-90.

- vi) Institut für Anwendungen der Geodäsie (Institute for the Application of Geodetic Techniques).

Findings by DGF started in the middle of 1970. Periodic reviews and evaluations of progress made were carried out in 1971, 73, 76, 79, 81 and 82. The financial support by DFG will cease by the end of 1985 and the programme will be terminated. The concrete results achieved were presented at two earlier international conferences held at London in 1974 and Bratislava in 1975. In addition, two national conferences were organized at Stuttgart in 1976 and 1979.

During the period 1970-85, SFB-64 had undertaken research and development in all areas relevant to light, long-span tension structures in the form of cable nets, tents and membranes. The areas investigated are :

- i) Materials
- ii) Techniques of form-finding
- iii) Stress analysis
- iv) Development of construction techniques, and
- v) Anchorage techniques

These studies made it possible to analyse design and build such space—setting structures as the West German pavilions for the Munich Olympics and Montreal World Fair and the Haj Terminal at Jeddah, Saudi Arabia. The research and developmental activities pursued by SFB-64 in the area of tension structures also gave the needed fillip to industry to develop suitable materials for building such tension membranes. The special textiles developed for this purpose include PVC-coated polyester fabrics and Teflon coated glass fibre. The latter found application in building of Haj terminal which won the Aga Khan award for excellence in architecture. Other significant contributions made by SFB-64 include :

(i) The adaptation of geodetic techniques—originally developed by surveyors—for form-finding of light, long span tension structures. These are essentially close-range photographic techniques for carrying out precise measurements of building components and deformation measurements in the field. The stereophotogrammetric technique was developed in 1970 and converging techniques were perfected in 1981.

(ii) Development of a computer program entitled FASNET for form-finding.

(iii) Writing of a computer programme MEMCUT for cutting of strips from the developed plans of curved spatial surfaces. This programme helps in cutting fabric strips for tension structures.

(iv) Development of a soap-bubble machine for generating minimal surfaces of tent-like structures.

(v) Extension of shadow Moire technique to measure surfaces coordinates of spatial structures.

There has also been a certain amount of spin-off from these research activities primarily focussed on light, long span tension structures. Two of these are specially worthy of mention :

(i) The method of using electrical inclinometers, originally developed for long span tension structures, found application in testing the accuracy of the parabolic shape of a large solar concentrator of 17 m diameter designed by Schlaich and Partner for Saudi Arabia.

(ii) Triangular cable-net structures suitable for cooling towers of thermal power stations have been developed in place of heavy concrete hyperboloids. In fact, a hyperboloid cooling tower made up of triangulated cable nets has already been built in West Germany. It is 146m high and 91m in diameter with a throat diameter of 82.5m. The triangular cable net is prestressed between a top compression ring and the soil-anchor foundation. The compression ring is suspended from a central mast 180m high. This structure is also designed by the firm of Schlaich & Partner of West Germany.

Conference Sessions

The papers accepted for presentation at the conference were grouped under the following topics : (a) Design and Architecture; (b) Form, Statics & Dynamics; (c) Techniques of Analysis and Measurement; (d) Materials and (e) Structural Design. Apart from West German experts, the conference attracted specialists from Israel, UK, Netherlands, Hungary, Poland, China, Bulgaria, USA, Italy, Canada, Australia, Czechoslovakia, Romania, Brazil and the German Democratic Republic and Japan.

Summary of The Delegate's Contributions To The Conference

The paper entitled "Hanging Ribbons of Ferroconcrete for long Span Roofs" was presented at the forenoon session on 21-3-1985. The paper develops a theory to predict the behaviour of thin hanging ribbons of ferrocement treating the structure as a beam-cable. An approximate method of analysis which leads to results of acceptable accuracy for structural design is also presented. Results of tests carried out on experimental ribbons are summarised. Possibilities of using such ribbons for building long span roofs are outlined.

The delegate also participated in the discussion on Dr Ramm's paper entitled "Collapse of thin Reinforced Concrete Shells: A buckling phenomenon?" He drew

the author's attention to the technical Report R 693 issued by the Naval Civil Engineering Research Laboratory, Port Hueneme, California published in Sept 70 wherein the buckling behaviour investigations carried out on a funicular shell 35' X 40' was reported. Participating in the concluding session, the delegation made the point that high-tech concepts will lead to cost-effective structures only if they can be translated into relatively simple construction techniques. This thesis was illustrated by referring to the work on funicular shells done in India by the delegates and his colleagues.

Summary of Conclusions Arrived at the Conference

On the last day of the Conference, there was a critical review of the achievements of SFB 64 over the past 15 years, Prof. Schlaich who was in the chair also invited participants from abroad to comment on possible future directions of research in the area of light, large span tension structures. The conclusions reached may be summarized as follows :

- (i) In the past fifteen years, most of well known light, long span tension structures built tended to be exhibition structures or prestigious structures built in oil-rich countries. In the years ahead, research and development efforts should be directed towards applying these concepts to medium span utilitarian structures.
- (ii) The technology developed in Germany will need adaptation to suit local conditions in other parts of the world.
- (iii) A point which the delegate made and which found wide acceptance is that high concept technology will result in cost-effective structures only if it can be translated into simple construction techniques. The example of the funicular shells, a high-tech concept developed by him and his colleagues in India and which are being built by using simple equipment and unskilled labour in the villages of India was given.
- (iv) It is necessary to identify suitable institutions in different parts of the world for the transfer of the technology developed in Germany on long span structures.
- (v) It was noted that the "International Conference on Light Structures in Architecture" scheduled to be held at Sydney, Australia between Aug. 25-29, 1986 would provide an opportunity to the delegates to make a detailed review of the relevance of tension structures for various applications in South East Asia and the Pacific.

Recommendations for Follow-Up Action in India

There is hardly any on-going organized research activity in India in the area of tension structures. In view of the many applications they have in practice, it will certainly be useful to set up a Light-weight Long-span Tension Structures Centre in India. The IIT Madras may perhaps be a logical choice for its location, because it was set up by a consortium of West German Universities. The complementary facilities available at SERC, Madras can be made use of in developing such a centre.

2. The advantages of using cable net structures for cooling towers in place of heavy reinforced concrete hyperboloids needs to be investigated. The delegate is getting in touch with large construction companies such as ECC which may be interested in this new development.

3. The membrane concave mirror developed for solar-concentrators as a spin-off of the research activity undertaken by SFB-64 may be of interest to the Department of Non-Conventional Energy sources.

Likely Impact of Conference on Indian Research Work

As already noted elsewhere, there is hardly any organized research activity in the area of tension structures in India. However, it is desirable to initiate such research activity in view of the many applications that tension structures have for providing large column free spaces. The Structural Engineering Research Centre, Madras, I.I.T. Madras and the School of Architecture at Ahmedabad are some of the institutions which have already established close links with the Institutes at the University of Stuttgart and it is at these institutions that the Conference will have an impact in stimulating research in the area of light-weight long span tension structures. These institutions shall be well advised to order proceedings of the conference and the reference publications listed in this report.

IASOC CONFERENCE : A REPORT*

Dr R V Venkateswaran, participated in the IASOC Conference at Ischia, Italy from May 20-25, 1984. IASOC (Ischia Advanced School of Organic Chemistry) has been established on the island of Ischia in order to foster frequent, gatherings of Italian and foreign chemists for the purpose of exchanging up-to-date research ideas and for exposure to the latest progress of organic chemistry. The first meeting of IASOC appropriately enough covered the topic of 'Carbon-Carbon Bond Forming Reactions', since in recent decades there have been extraordinary advances in organo-chemical synthesis, including especially Carbon-Carbon Bond Forming Reactions. The School has been designed to widen the research vistas of practitioners of the field. Under this context the scientific program of the first IASOC comprised lectures by invited speakers and short research presentations by accepted school participants. Both speciality topics within the field and pedagogically important broad coverage of the area were presented by the invited speakers. Besides the lectures and research presentations, there were also some audience participated workshops, involving solutions to some mechanistic problems in organic chemistry and also covering general area of futuristic significance as detailed later.

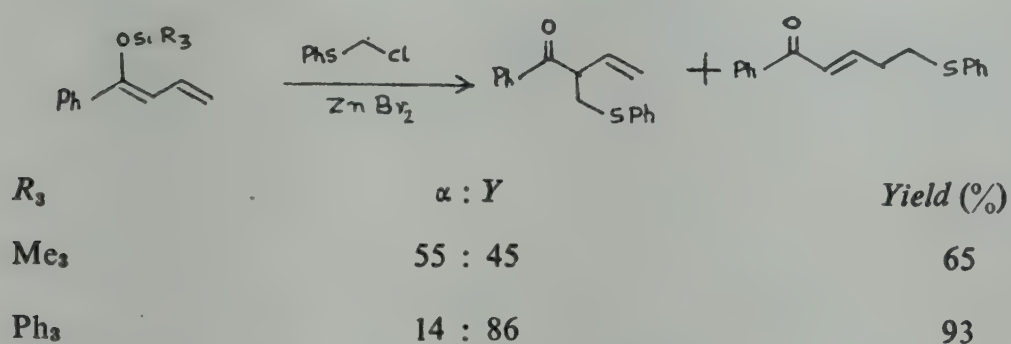
Conference Report

Recent decades have witnessed significant advances in organo-chemical synthesis especially carbon-carbon bond forming processes. In the first meeting of IASOC, at Ischia, Italy, distinguished chemists from all over the world presented broad coverage of the area and some of the recent developments relating to new methodologies in carbon-carbon bond forming reactions, new reagents in pursuit of selectivity, asymmetric synthesis and natural product synthesis.

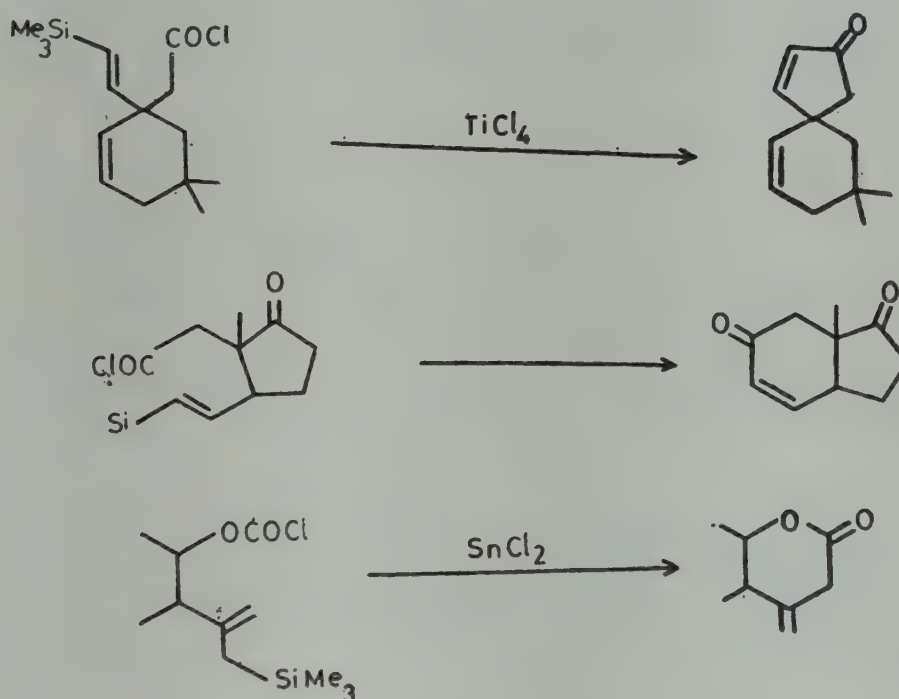
Professor I Fleming (Cambridge, UK), in his invited lecture described the versatility of silicon compounds in the realisation of enhanced reactivity and desired reaction course. Though the advent of silicon compounds in synthetic organic chemistry has been only during the last two decades, the exceptional utility of silicon mediated reactions had led to an explosive growth in this area and in the process has made short work of many otherwise difficult processes. Professor Fleming, himself a pioneer in the development of novel synthetic processes utilising silicon,

*Based on the delegation report of Dr R V Venkateswaran, Department of Organic Chemistry, Indian Association for the Cultivation of Science, Jadavpur, Calcutta.

described the multifarious ways to which it has been put, of which excellent reviews are already available. Some recent studies covered the control of silyl group by varying the ligand it carries for example changing the usual methyl ligand to phenyl.

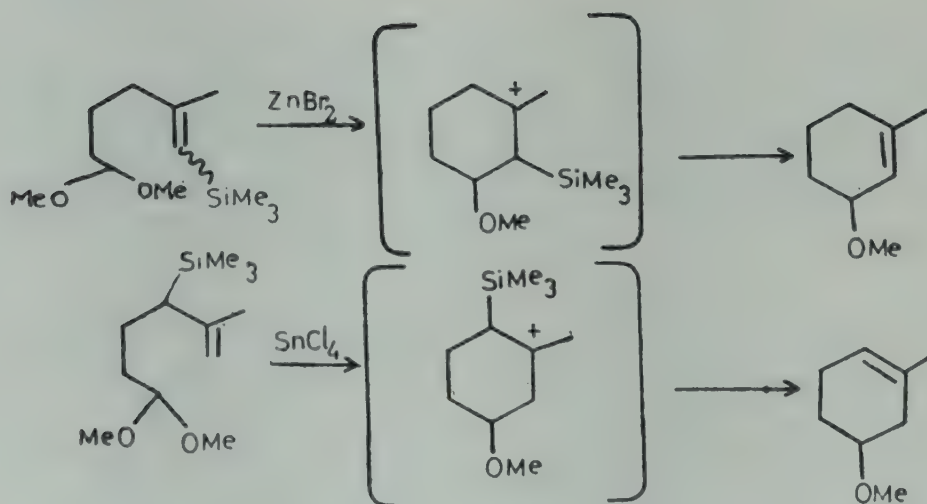
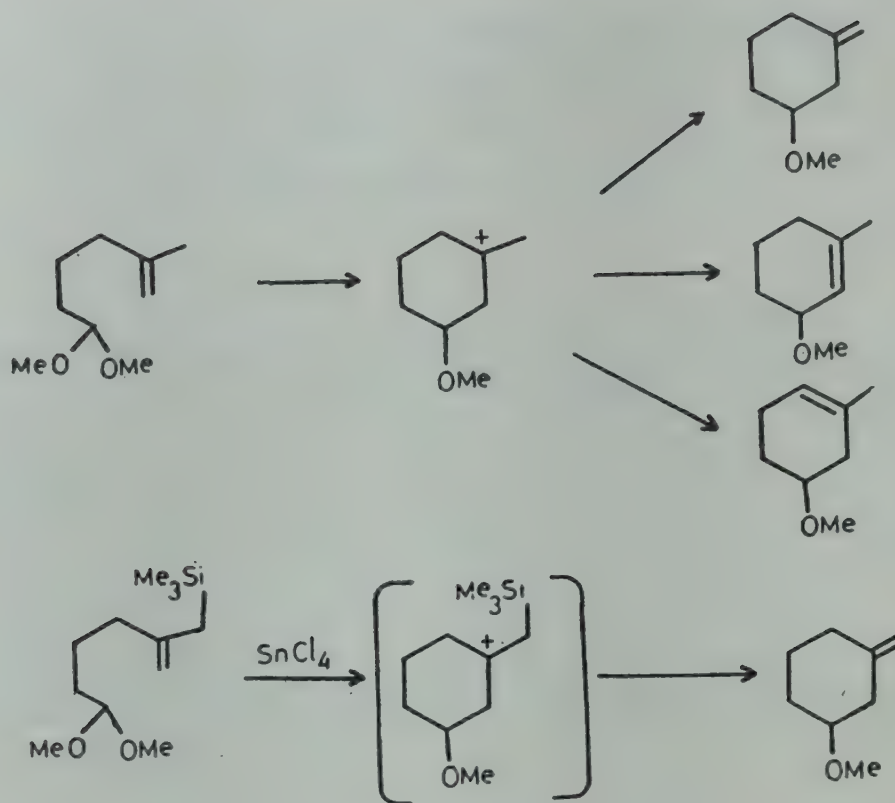


The enhanced reactivities of vinyl-allyl-silanes are evidenced in the following transformations.

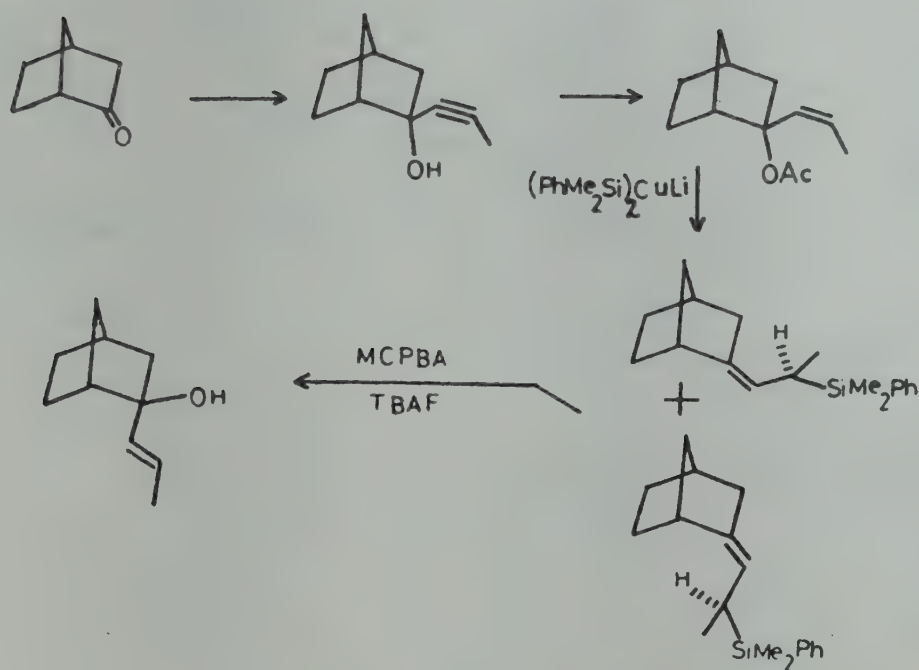


An interesting case of versatility of silicon is in the synthesis of the individual compounds in the mixture from Johnson's cyclisation.

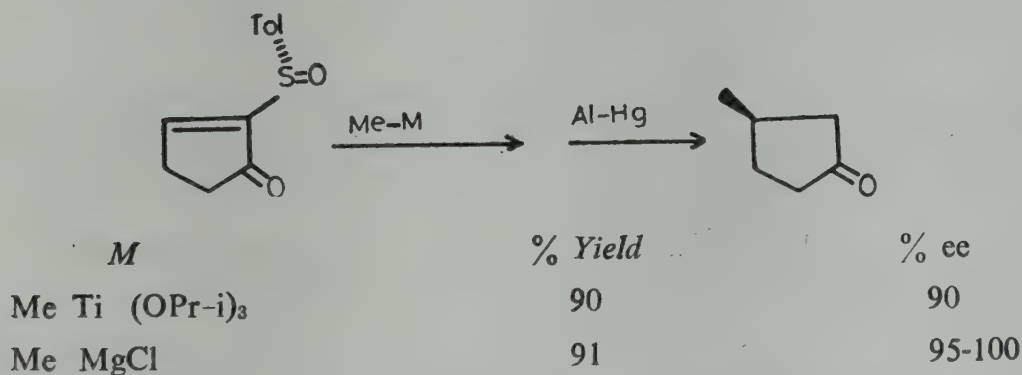
Through silicon mediated synthesis, each of the component in the mixture is made available.



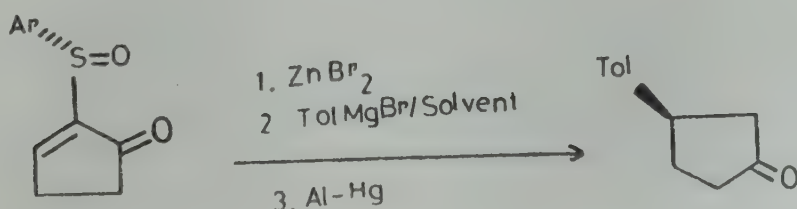
The following illustrates yet another advantageous applications of silicon mediated synthesis, where stereochemical inversion has been realised.



Asymmetric synthesis of carbon-carbon bonds in an organometallic complex catalysed reaction with the organic moiety, the ligand or even the solvent employed acting as source of chirality was elaborated by Professor G. H. Posner (Johns Hopkins University, U.S.A.) in his invited lecture. He detailed the role of β -ketosulphoxides in chiral induction, an area in which he has made significant contributions.

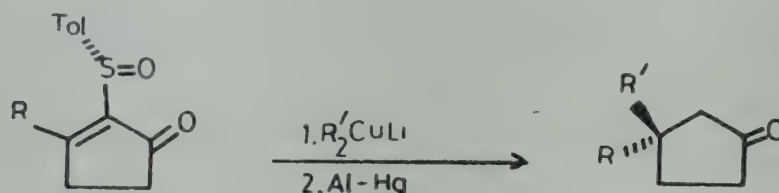


The methyl group could be substituted by a host of other alkyl or aromatic groups with more than 90% ee in all cases. A pronounced effect of solvent was also observed in this reaction.



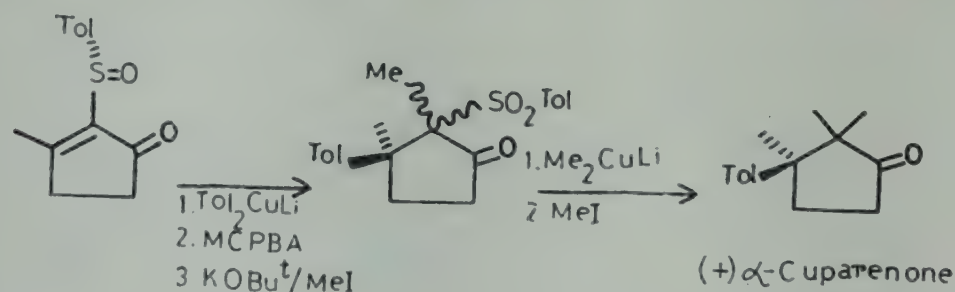
<i>Ar</i>	<i>Solvent</i>	% ee	<i>R</i> : <i>S</i>
P — Tol	THF	58	4 : 1
P — An	THF	69	6 : 1
P — Tol	DMTHF	86	13 : 1

The reaction could also be extended to involve generation of quarternary centres.

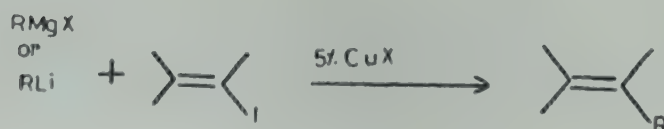
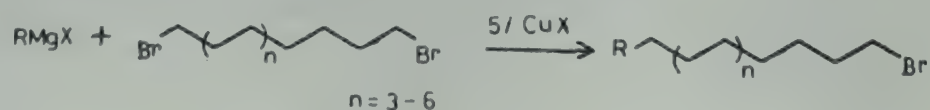


<i>R</i>	<i>R</i> ¹	% Yield	% ee
Me	Tol	53	93
Tol	Me	58	78

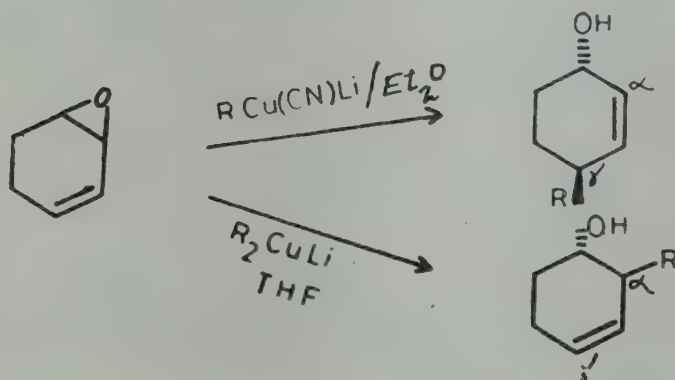
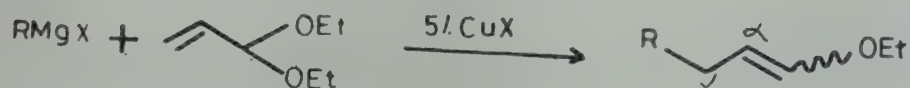
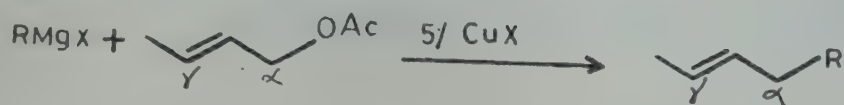
Such outcome was advantageously utilised for a facile synthesis \oplus α -cuparenone.



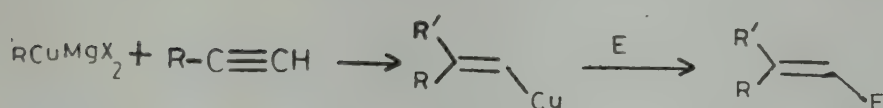
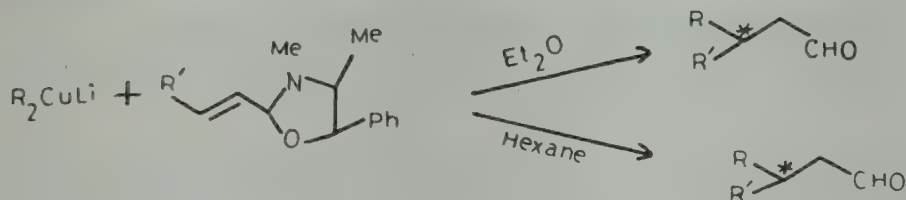
Professor J F Normant (Paris), in an invited lecture introduced the audience to some recent developments in organo copper chemistry.



In other reactions product dependence on substrate nature leads to interesting variations.

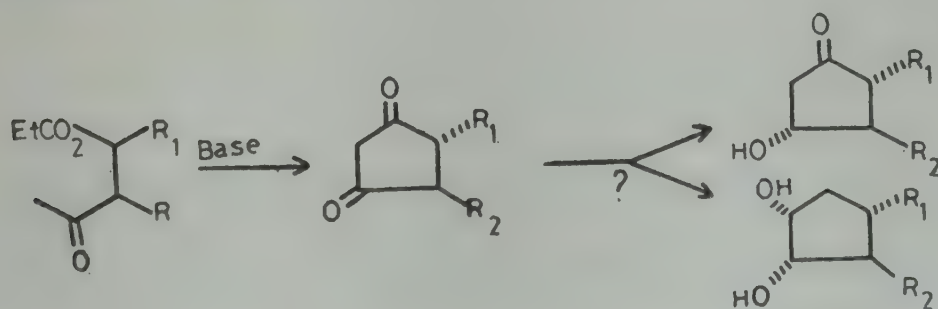


Solvent controlled outcome of product composition has other examples.

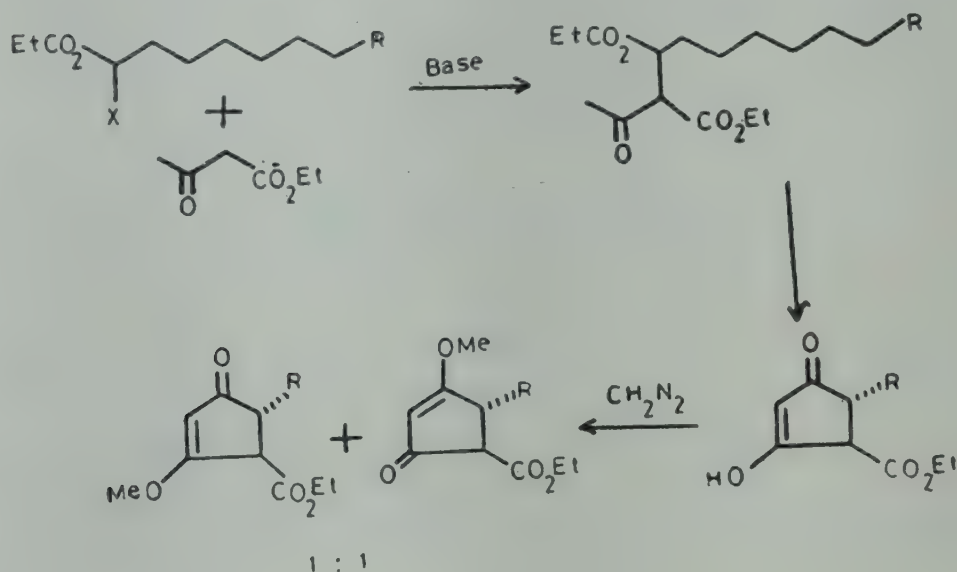


The stereoisomeric purity in the last of the above reactions is greater than 99%.

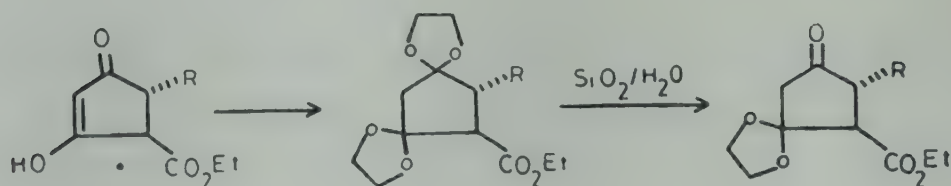
A new approach to cyclopentane derivatives was disclosed by Professor Cainelli (Bologna, Italy).



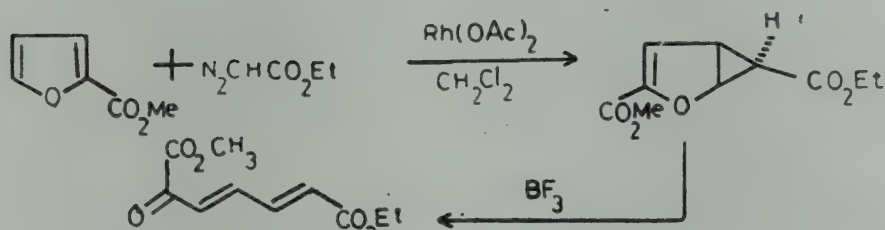
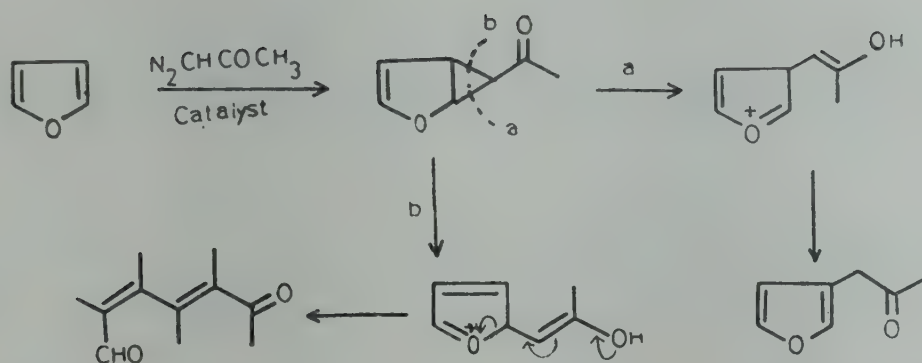
Though the reactions involved were somewhat of a classical nature, the route provides easy access to multifunctionalised cyclopentane derivatives and was utilised in their synthetic efforts towards prostanoids and jasmonoids.



The difficulty encountered in distinguishing the carbonyl groups was overcome in a fortuitous way through ketalisation experiments.

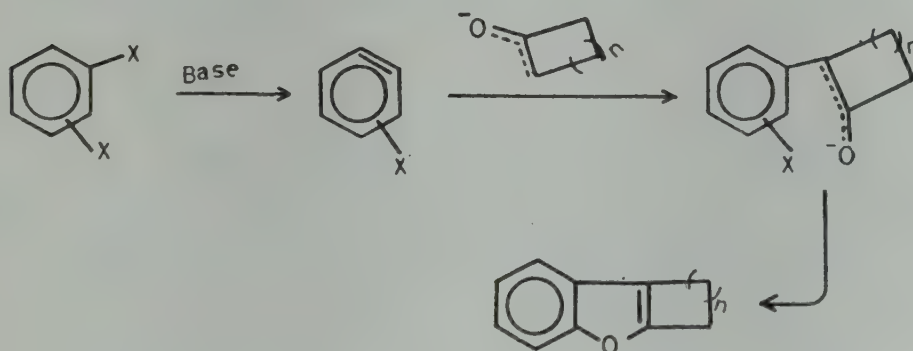


In his invited talk, which he dedicated to the memory of late Professor R V Stevens, Professor Wenkert (San. Diego, U.S.A.) illustrated some novel applications of α -diazocarbonyl compounds in synthesis. These covered preparation of polyene type of compounds through addition to furan substrates.

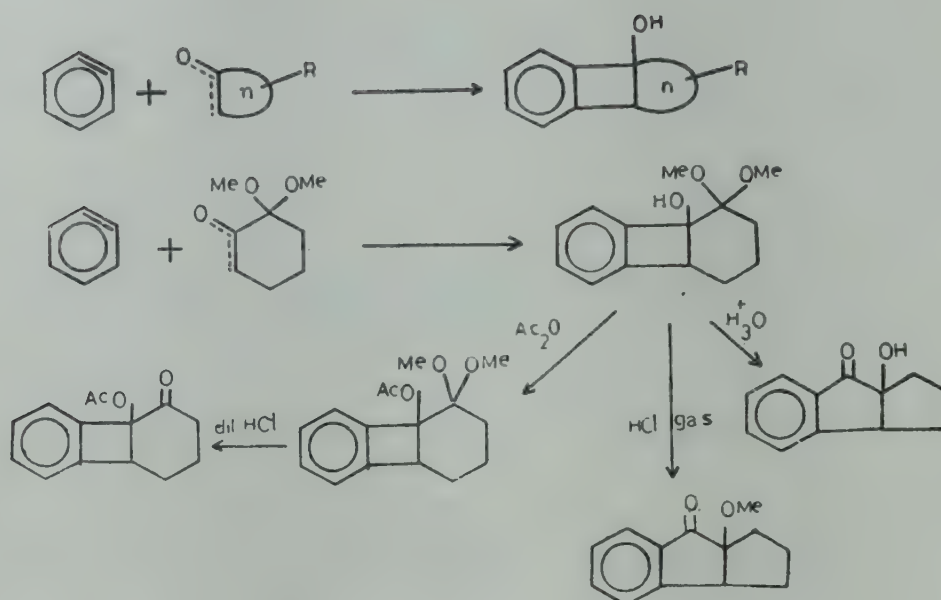


The addition always takes place on the unsubstituted double bond. This interesting method for polyenes was extended for a synthesis of a leukotriene component.

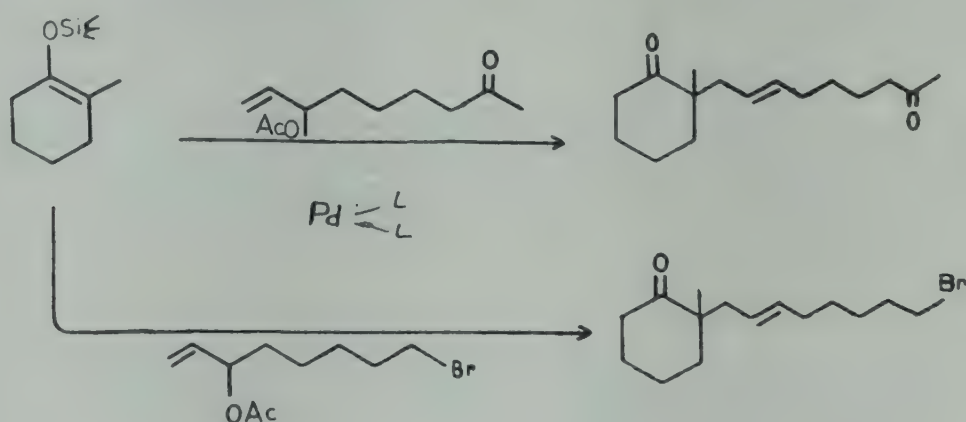
Professor P Caubere (Nancy, France), in an invited talk, elaborated on their contributions in the aryne and S_NAr reactions of polyhalogeno-benzenes with carbonyl compounds, which lead to a novel synthesis of benzofurans.



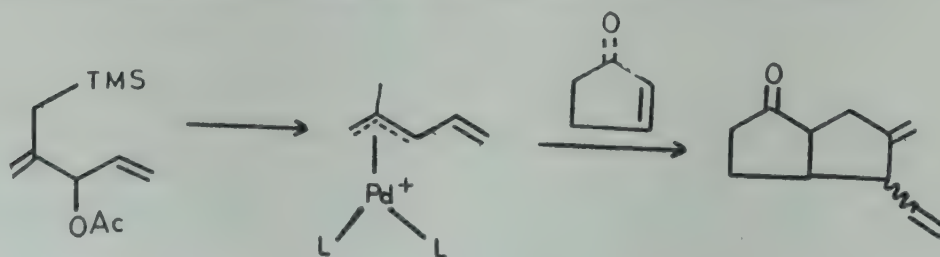
Multifunctional enolates in above benzyne cyclisation lead to interesting benzocyclobutenol compounds and benzopentalenes.



The need to harness modern reagents and design novel pathways in the pursuit of selectivity in organic synthesis was stressed by Professor B Trost (Wisconsin, U.S.A.) in his highly illuminating invited talk. He reviewed his contributions, spanning a number of years, involving metal catalysts, particularly palladium catalysis, in the realisation of this objective.



In absence of palladium displacement will occur at the bromide in the latter case. Recent development in this area related to a highly novel approach towards construction of five membered rings through cyclo-addition (?) reaction.



The role of complex metal chelates in asymmetric induction was brilliantly brought out by Professor T Mukaiyama (Japan) in his invited talk. There has been very extensive and notable contribution by him over many years in this area which was reviewed.

In a fitting finale to the meeting, Professor Y Kishi (Harvard, U.S.A.) detailed the many inspiring and interesting challenges in his projected synthesis of the complex natural product palytoxin.

Besides the invited lectures, there were 15 short research presentations and workshops with schedules of audience participating discussions on problems of organic chemistry and future of organic synthesis. These workshops evoked a very good response from the audience and there were very interesting and inspiring discussions of immense value to the participants.

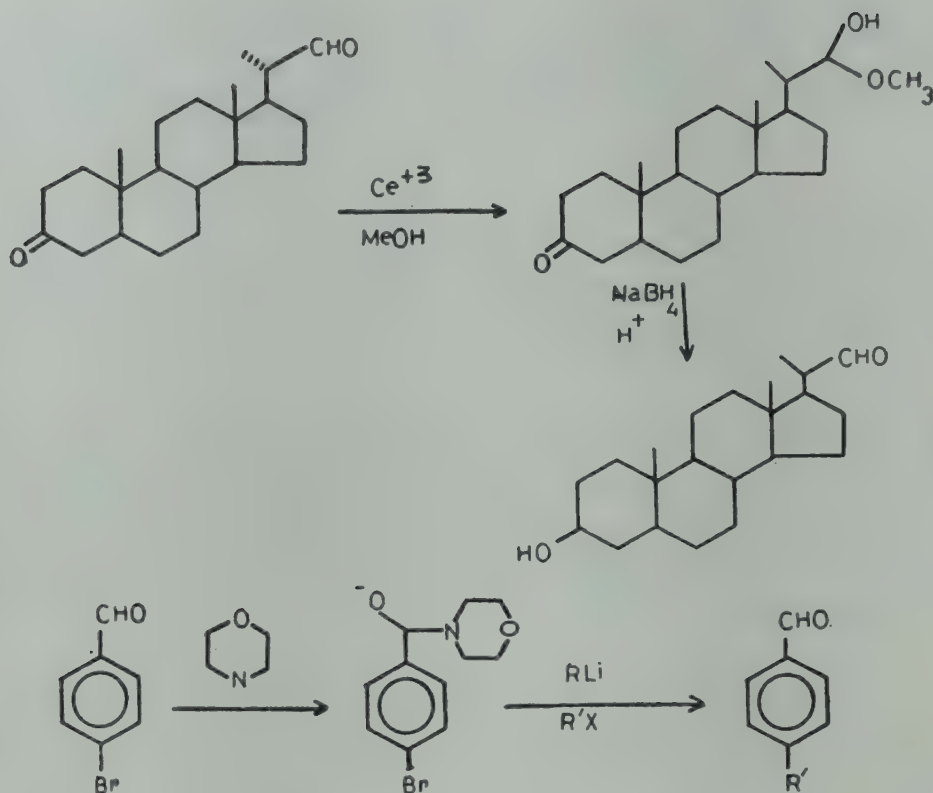
Work-shop Sessions

Three work-shops were held which were mainly devoted to audience participating discussions of problems of organic chemistry.

The first one had Professor I Fleming as the discussion leader, who put up six mechanistic problems in organic chemistry in which silicon plays a part. Through a rigorous participation from the assembled delegates these were explained based on the working principles involved in the chemistry of silicon like, it stabilises a β -carbon, it is more easily lost from carbon than hydrogen, it stabilises an α -anion and it is the weakest of the metals.

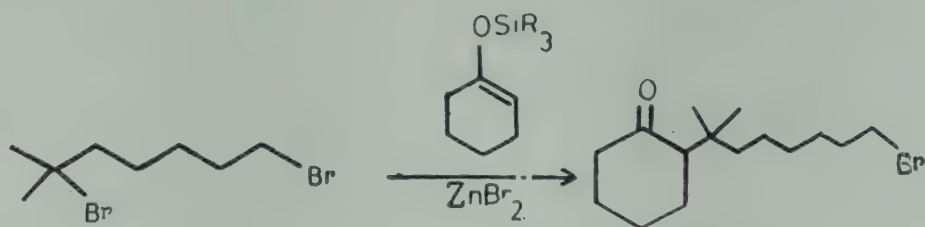
The second work-shop with Professor Trost as discussion leader proliferated into a new look at some of the common practices in execution of organic chemistry.

Common practice has demonstrated the relative reactivity of various functional groups in organic chemistry. How can the organic chemist devise ways to subvert the usual order of reactivity? In many instances this has involved additional sequences of protection of the more reactive functionality and at a later stage deprotection. Ways must be devised to avoid this unpalatable sequence of protection, 'crutches' as termed by Professor Trost. As an example when a ketone and an aldehyde are both present, reaction at the ketonic centre requires a prior protection of the aldehyde. Utilisation of Leusch reagent avoids this.



These are only cases of 'in situ' protection and do not involve any discrete step.

Another instance of subverting the usual order of reactivity is in the case of displacement of a tertiary halide in presence of a primary. This is achieved by carrying out an SN_1 instead of an SN_2 reaction.



The third workshop was a panel discussion on the 'future of organic synthesis'. The panel comprised eminent chemists like Professor H C Brown, Professor E. Wenkert, and Professor Viehe. Free expression of opinions from the audience was also solicited. Having briefly analysed the remarkable developments in organic synthesis during the last couple of decades, which have led to development of novel reagents of wide utility and new reaction techniques, apart from realisation of elegant syntheses of many complex natural products, it was felt that the present time may be termed a water-shed in the evaluation of organic synthesis. Organic chemistry has evolved from an empirical art to an exact science and transformations thought impossible until 25 years ago are being routinely carried out thanks to the

developments mentioned earlier. What of the future? Professor Trost correctly diagonalised the role of chemistry as a fulcrum between mathematics and physics on one side and biological sciences on the other. But conspicuously chemists in general have succeeded less in influencing trends on a national or international level relative to people in other disciplines like physics or biology. To a large extent as observed by Professor Fleming this could be due to chemistry having no language of communication like physics or biology and the real problem amounts to selling chemistry to people. It was agreed that this was a point that needs deeper evaluation and further discussions by leaders in the field. Consensus emerged on the positive role of organic chemistry, particularly organic synthesis in efforts related to alleviation of human sufferings and this should be further boosted up to solving problems of the future. It was also observed, that there is a declining trend in the matter of funding of organic chemical researches and efforts must be initiated to improve this situation.

The discussion concluded on the optimistic note that against the background of developments in the immediate past, the future of organic synthesis holds out immense potential towards improvement and new developments and that the task before every organic chemist is also to explore the applicability of these developments in the alleviation of human sufferings and improve the living status.

III INTERNATIONAL CONGRESS OF CELL BIOLOGY A REPORT*

AN Bhisey and Dipika Kaul attended the III International Congress of Cell Biology which was held in Tokyo, Japan, from August 26-31, 1984. The Congress was formally declared open by the Crown Prince Hironomyia on 26 August, 1984 in a brief ceremony at NHK Hall, Tokyo. The Prominent speakers were Dr. T. Okigaki-Secretary General, Dr S Seno, President, Dr R Brinkley and executive officers of the Japanese Government. Dr H Stanley Bennet delivered his inaugural address on "The Historical Foundations of Japanese Cell Biology". The scientific programme consisted of Plenary lectures, symposia, technology, workshops, poster sessions and film sessions.

The first plenary lecture was given by Dr Nicole Douarin of France. She discussed role of neural crest cells in the origin of different constituents of the peripheral nervous system. She has used an extremely elegant cell marking technique based on the differences in the nuclear morphology between cells of chick and Japanese quail. The Quail-Chick system provides a full picture of the neural crest derivatives and allows fate maps to be developed. By doing reciprocal transplantation of neural crest between these two species, the migration of cells and their contribution in the development of different parts of the nervous system can be precisely followed. This was further aided by the use of a monoclonal antibody which recognizes neural crest cells. Fate maps have been constructed which indicate the level of neural axis from which various crest derived structures originate and the role of ectodermal placode in the genesis of sensory ganglia of the cranial nerves. Their current work in on the actual state of determination of neural crest cells or the regulation of genetic programme.

Professor KR Porter gave a plenary lecture on granule translocation in fish chromatophores. It is known that microtubules (MT) and microfilaments (MF) play a role in granule translocation but other factors also influence pigment movement. Professor Porter studied chromatophores in different stages of granule movements fixed by critical point drying and by high voltage electron microscopy and stereo viewing. granules were found to be suspended in three dimensional micro-trabacular lattice and associated with smooth endoplasmic reticulum which presumably controls local Ca^{++} levels. Granules move at uniform velocities during aggregation and saltate during

* Based on the delegation report of Dr A N Bhisey, Officer-in-charge, Cell Biology Division, Cancer Research Institute, Tata Memorial Centre, Parel, Bombay-400012 and Dr Dipika Kaul, Reader, Department of Zoology, University of Allahabad, Allahabad, U.P.

dispersion. During aggregation the trabaculae become beaded and shortened. The lattice expands during dispersion. The granules seem to occupy fixed positions in cells. Ca^{++} controls pigment movement.

In his plenary lecture on 'Stable Complexes that Activate and Repress Eukaryotic Genes', DD Brown discussed aspects of molecular interactions that activate and repress eukaryotic genes. In somatic cells of *Xenopus* oocyte, 5S RNA genes that comprise a multigene family are transcriptionally inactive while the smaller somatic 5S RNA gene is active. This transcription control cannot be reproduced in cell free extracts *in vitro*. A minimum of three factors is required for the formation of stable transformation complexes, one of which the Transcription Factor IIIA (TF IIIA) interacts specifically with 5S RNA genes. The oocyte 5S RNA genes in somatic cells are not associated with these factors. They are maintained inactive by a complex requiring histone H_1 . If the histone H_1 is first removed the oocyte 5S RNA can be made transcriptionally active with exogenous transcription factors. Thus, for 5S RNA gene activity is specific involving interaction with positive transcription factors : repression in general involving a protein (H_1) that is universally present in chromatin. Both active and repressed states are stable and not in equilibrium and hence the same sets of genes can remain active for long periods of time.

Dr Tonegawa talked about genetic strategies to recognise immune complexes in his plenary talk. In spite of the extensive work on role of T cells in cell mediated immunity, T cell receptors have been elusive. A receptor from cytotoxic T cell was characterised by DNA cloning. The receptor is Ig like. It has a signal sequence, V- and C like region which are homologous but distinct from V and C regions of B chain. There is a hydrophobic transmembrane sequence followed by C terminal cytoplasmic portion consisting of 280 residues. Three C-DNA clones have been prepared. Glycosylation sites have not been observed. The receptor is made up of 2 chains A and B which are linked on the outside of the membrane by a disulfide bond.

The plenary lectures were followed by symposia held simultaneously. The symposia were on following broad areas. (1) Genome and gene engineering (2) Membranes (3) Organelles (4) Cytoskeleton and cell motility (5) Cell Sociology (6) Cell pathology and ageing. These were subdivided into many specific topics. Technology workshops and film sessions were held late evening. The poster sessions had new sets of posters presented every day.

The delegate (ANB) attended symposia mainly on cytoskeleton and cell motility and some presentations on membranes and genome. Presentation in symposia on cytoskeleton were subdivided into microtubules and intermediate filaments (IF), actin filaments, membrane cytoskeletal interactions and other topics. Dr Brinkley proposed that kinetochores may exist as independent subunits, which may fuse to form larger units as the chromosome number decreased during evolution. This was shown in two

species of muntjac. He also showed polypeptide patterns of highly enriched kinetochores. Dr Goldmans group provided evidence for IF acting as links between nuclear membrane and cell surface with the use of monoclonal antibody to IF associated proteins. Dr Franke presented extensive data on differential cytokeratin expression in different epithelial cells and also showed that these are coded by separate genes which are regulated at the level of transcription. The different keratins show similarities in the α -helical region but not in the non-helical regions. Each cell type expresses one acidic and one basic cytokeratin. The keratin fibres attach to desmosomes in plasma membrane. Two large polypeptides of the desmosomes viz. desmoplakin I and II were characterised and their interactions with keratins studied. Vimentin filaments also interact with desmoplakins.

Dr Borisy showed the appearance of specific phospho-proteins in associated with MT organising centres (MTOCs) in prophase, by a specific antibody and proposed that these phosphoproteins regulate the enhanced MT nucleating capacity of MTOCs.

In the symposium on Actin filaments, Dr Korn presented extensive data on the kinetics of actin polymerization in the presence of ADP and ATP. ATP caps the filament and stabilizes it. Dr Pollard showed the effects of various actin binding proteins in *Acanthameba* on actin polymerization. Profilin, binds to actin monomer and inhibits polymerization. Capping protein, a heterodimeric unit binds to the barbed end of actin filaments and blocks polymerisation while gelation protein cross links filaments into a 3-D network. Dr Asano compared the properties of actinogelin and α -actinin which have similar molecular properties. Partial immunological cross reactivity was observed by more sensitive assays. Actinogelin was localized in the spindle in mitotic cells. The results suggest that Ca^{++} sensitive actinogelin and Ca^{++} insensitive β -actinin have some part of molecule in common. Dr Isenberg gave a comparative account of actin filament capping proteins such as Profilin, Actophorin, Cap. 29 and 31, Gelation protein 260, α -actinin, Cap 42/47, Cap (42) b and fragmin. The last three proteins share a high degree of homology. Dr H Ishikawa showed by electron microscopy that MF which attach to plasmalemma at their ends are unidirectionally polarized with arrow heads pointing away from the cell membrane. MT and IF were also seen to attach directly to plasmalemmal undercoat. Dr Branton proposed a model on binding of erythrocyte membrane proteins and cytoskeleton involving ankyrin, spectrin, band 4.1, 4.9 & actin.

Dr Lazarides discussed expression of spectrins during development. Erythrocytes express α - and β subunits of spectrins while muscle cells during early development have $\alpha\gamma$ but later have $\alpha\beta$. Dr Lazarides reported on alteration in the expression and localization of spectrins in neural tissue in chicken. In cerebellum, $\alpha\gamma$ was seen in cell bodies while $\alpha\beta$ was axually transported. Two forms of ankyrin were seen in the neural tissue and distinct cytochemical domains could be distinguished on the basis of their experiments.

Dr Small showed changing cytoskeletal patterns in moving fibroblasts by a combination of cinematography and immunofluorescence with 3 antibodies using image superimposition and multiple image analysis techniques. A study of MT in relation to leading edge suggested that MTs predetermine and stabilize ruffling foci. With the use of monoclonal antibodies against junctional complexes, Dr Gevger identified a membrane protein (mol. wt. 135 kd) exclusively associated with adherence junctions.

In the symposia on genomes, Dr Razin demonstrated that in cell given mitogenic stimuli methylase level increases preventing loss of methyl groups while in differentiating cells, alterations in methylase levels are associated with a loss of methyl groups. These transient alterations cause a fine regulation based on reversible modification of dimethylase molecules. Dr Felsenfeld examined chromatin for alterations in nucleosome structure in the transcriptionally active β globin gene. He found a 200 BP long sequence in the 5' flanking region which possess interesting properties with respect to methylation and sensitivity to S_1 nuclease. Dr Gellert presented data on regulation of DNA replication and transcription by alteration in DNA supercoiling through the activity of Gyrase A and B and Topoisomerase I and discussed their implications in gene expression. In the symposium on 'Membranes'. Dr Silverstein discussed differences between ligands which induce phagocytosis or those such as C_3b which after binding are not internalised. However, plating cells in fibronectin coated surface or treatment with TPA results in internalization. Such phagocytosis however does not stimulate superoxide production. The activation of phagocytosis is reversed after removal of TPA. Thus, extracellular factors regulate processing of signals at the level of individual cells. Dr Uchida reported studies on the determination of functional domain of diphtheria toxins with the use of 17 monoclonal antibodies. One of these reacts between region 30-45 K from N-terminus and does not block binding of toxin for cell surface. Another antibody which binds to 17K C terminal region blocks binding. An inhibitor of cytotoxicity was also isolated from toxin sensitive and insensitive cells.

A very interesting model for splicing messenger RNA precursors involving the formation of a large multi-component complex has been suggested. The model is supported by the findings that the intervening sequences are excised intact and the intermediate is only cleared at the 5' spliced site. In the latter case the 5' exon must be retained in the complex to ultimately be spliced to the second exon. This hypothetical complex would have to have a structure that juxtaposes the appropriate spliced sites for processing.

By an analysis of *in vitro* processing of human β globin messenger RNA precursors synthesized *in vitro* from a bacteriophage Sp. 6 promoter fused to the human β globin gene Maniatis provided evidence that sequences within the introns of genes from higher eukaryotes actively participate in splicing.

The cells of higher organisms have a highly refined ability to discriminate among genes, turning on only those appropriate for their stage of development and mission in life. Several speakers dwelt upon how this discrimination could be achieved. In the spacer region of *Xenopus laevis* ribosomal genes a 60-81 base pair long repetitive sequence element is found which acts as enhancer on the promotor at the 5' end of the gene.

A number of interesting films were presented in the film session. Dr Migashi Fujime presented an excellent film on sliding of myosin filaments on actin filament bundles. Our paper on chemotaxis in this session was well received. The technology workshops described new sensitive system for microscopy. Dr Allen described video enhanced microscopy which by digital enhancement intensifies cytoplasmic structures such as MT using a conventional microscope. Dr Vanagaida described an epifluorescence system using an argon laser which can measure a single fluorescent dye molecule and record it on a video tape. Dr Takamatsu described various modifications to increase the accuracy and sensitivity of flow cytometry.

A very large number of posters were presented every day. Dr Gall presented a poster on in situ hybridization of DNA on 1 μ thick tissue sections embeded in methacrylate. This method will increase the resolution of this technique greatly and will be very useful in locotion of genes. Negative control of macrophage function was shown in hybrids between macrophages and myeloma cells.

A poster by Dr Khodadad showed differences in the cytoplasmic domain of erythrocyte membrane band 3 protein. These cells are resistant to alteration under conditions where human RBCs are drastically affected. A number of new membrane proteins, cell aggregation molecules or cytoskeleton associated proteins were reported. Dr Rubin showed that tubulin preferentially binds to membrane in certain human leukemias. This surface tubulin is different from cellular bulk tubulin. A large number of posters reported on the development and use of monoclonal antibodies against various cellular components, such as membrane proteins, cytoskeletal proteins, enzymes etc. Dr Elvin demonstrated a unique cell substrate contact site named rosette close contacts in invading transformed cells. Dr Ogawa and co-workers presented an excellent poster on an analysis of differentiation of mouse haemopoietic stem cells by separating daughter cells in the first division and following up the progeny. The results showed that monopotent progenitors are derived from pleuripotent cells directly during one cell division. A gene required for transit of human cultured cells through G 1 phase was isolated by Dr Sinmoussa. Dr Peters reported that monoclonal antibody production by hybridoma cells was optimal at 30-33°C. The session on cytoskeleton had a large number of papers on MTs. They dealt with Taxol-MT interactions, role of MAPs, new MT inhibitors, actin polymerization regulation and IF membrane interactions. The conference was well organized and the level of discussion was very high.

The participant (DK) was primarily involved in the poster session topic Genomes especially section on 'Chromatin & Chromosomes' (G-2) in which her work was presented in the form of two posters entitled 'Genomic Heterogeneity of the Avian Order Coraciformes' (Poster No. 1077) and 'Heterogeneity of the Sex Chromosome Heterochromatin in the Genus *Parasarcophaga*' (Poster No. 1079). The evolutionary significance of the Avian Order Coraciformes was discussed with fellow workers in the field especially Dr N Takagi (Hokkaido University). Problems of mutual interest regarding the W-chromosome and W-heterochromatin were discussed at length with Dr Shigeki Mizuno (Tohoku University) who described certain Genus specific and "Common" repetitive DNA sequences in the W-chromosome of the domestic fowl, *Gallus sp. domesticus* which could not be detected in three other Galliformes. Nature of heterochromatin in the genus *Parasarcophaga* was discussed among others with Dr M L Pardue (MIT, Cambridge, Massachusetts, USA) and Dr S Matsui (Rosewell Park Memorial Institute, Buffalo, New York). Further characterization of heterochromatin by banding of chromosomes with restriction endonucleases was discussed with Dr Yoshihiro Kato of Department of Developmental Biology, Mitsubishi Kasei Institute of Life Sciences, Tokyo, JAPAN.

The delegate (ANB) had two presentations at the conference. One was in the film session on 'Defective Chemotaxis in CML granulocytes'. This has been reported for the first time and is appearing in the Journal 'Leukemia Research'. This work was supported by grant from the Indian National Science Academy. The second paper on patterns of Cytoskeletal organization which was presented in the poster session. Patterns of four proteins namely tubulin, actin, vimentin and desmin with specific antibodies were studied.

On the invitation of National Research Council of Canada it was decided to hold the Fourth International Congress on Cell Biology in Montreal, Canada from August 14-19, 1988.

It was strongly felt that Indian students if they have to take seriously to molecular biology research must be given a very extensive and exhaustive training in biochemistry, biophysics and mathematics and should be exposed to equipment and Methodology of molecular biology research.

Besides attending the above conference, Dr A N Bhisey visited a few other research institutes in Japan. The following report is based on his experiences. The delegate worked at the Institute of Medical Science, Tokyo, in the Laboratory of Professor T Kuroki. Kuroki is one of the pioneer workers who used the system of monolayer cultures for the study of carcinogenesis '*in vitro*'. The technique of mouse keratinocyte culture was learnt and practised in this laboratory by the delegate. Cultures were prepared a number of times from new born mouse skin and differentiation was delayed by using low calcium medium. The cultures grew well. Fibroblasts were very few and highly enriched epithelial cell cultures were obtained.

Cultures of keratinocyte from human skin were also attempted once. In addition, the technique of freeze fracture electron microscope was learnt in Professor Hirosawa's laboratory. *Drosophila* eyes were used for fracturing. A talk was delivered on 'Defective functions of granulocytes from human Chronic Cyeloid Leukemia' at the Institute.

Japanese Research Centre for Tissue Culture established at the Dokkyo University School of Medicine was visited. This is a very well planned tissue culture laboratory where a variety of projects have been undertaken in addition to development of new cell lines. These workers have developed a cell line of fibroblasts from Indian muntjac. Time lapse cinematographic studies in chemical carcinogenesis, effects of drugs on cells are in progress in this laboratory. The delegate attended a seminar and showed a film on the mechanism of CB induced enucleation of fibroblasts at this laboratory.

The Japanese National Cancer Research Institute was visited. The Biochemistry Division of this Institute has extensive programme of testing mutagens, carcinogens from various products. They have shown mutagenic carcinogenic activity in a number of pyrolysates from hamburgers etc, in different preparations of soya bean sauces used in Japanese cooking. The Japanese sauces prepared by fermentation are more mutagenic. Many foods with nitrites have also been shown to be mutagenic. Work is also in progress on C-myc expression. They have observed increased C-myc expression in rat hepatomas and are now sequencing C-myc gene from hepatomas. Dr Terada, is looking for the possible involvement of an oncogene in stomach cancer which are high in Japan. In transfection of 3T3 cells with DNA from a stomach cancer cell line, he has obtained transformed colonies. This transforming sequence has been isolated and its homology with Ras gene, if any, is being evaluated. Work is in progress to clone this sequence. The Biophysics Department of the institute is studying DNA carcinogen interactions and DNA adducts by ESR. Dr Sekiguchi is studying regulation of cytoplasmic markers in cells reconstructed by fusing mouse nuclei with rat cytoplasts and melanosome synthesis in cybrids between teratocarcinoma cells and melanocyte cytoplasts. Dr Fujiki, has done extensive work on isolation and mode of action of a number of tumor promoters such as Teleocidin, Aplysiatoxin, debromaplysiatoxin, and is involved in studying their mode of action. Both these promoters have a mode of action similar to that TPA. Dr Fujiki and co-workers have prepared a number of derivatives and are evaluating the molecular structure necessary for promotor action.

The delegate was invited to give a talk at the Department of Pathology, Kawasaki Medical School, Kashiwara city. Dr Namba of this Laboratory has developed a system of radiation carcinogenesis using human diploid fibroblasts and also a cell line from a human colon carcinoma which produces tumors in nude mice. Professor Kimoto is working on regulation of differentiation in HL-60 cells by exogenous agents. This is one of the newly built medical colleges and excellent teaching and laboratory facilities.

III ASIA-PACIFIC CONFERENCE AND WORKSHOP ON ELECTRON MICROSCOPY : A REPORT*

Professor C Suryanarayana attended the III Asia-Pacific Conference and Workshop on Electron Microscopy held at the National University of Singapore from August 24—September 2, 1984. The conference, organized under the auspices of the International Federation of Societies for Electron Microscopy (IFSEM) was the third in the series—the first one was organized in Tokyo in 1956 and the second in Calcutta in 1965. The objectives of the conference and workshop were :

- (i) to promote the usage of electron microscopes and associated instruments in biological, medical and physical sciences,
- (ii) to promote exchange of information and experience among users, and
- (iii) to discuss the latest developments in the field, and
- (iv) to provide training for users and research workers in electron microscopy.

Workshop

The conference was preceded by a six-day workshop (24-29 August) sponsored by the Australian Development Assistance Bureau and organized by Dr D J H Cockayne of University of Sydney. It was divided into three Courses—(i) Biological Specimen Preparation for Electron Microscopy, (ii) X-Ray Microanalysis in the Electron Microscope and (iii) Transmission Electron Microscopy—and each consisted of lectures, demonstrations, tutorials and problem solving sessions. The number of participants in each group was limited to 25 to make the course effective. International experts, experienced in the training of electron microscopists, lectured at these sessions. This was a highly successful experiment. On the last day of the workshop (which also happened to be the first day of the conference) several experts in the field such as professor H Hashimoto (Japan), Dr H Endoh (Japan), Dr D J H Cockayne (Australia), Dr J V Sanders (Australia), Professor G Thomas (USA), Professor S Horiuchi (Japan) and Professor Y Bando (Japan) presented state-of-the art lectures on the various facets of electron microscopy.

* Based on the delegation report of Professor C Suryanarayana, Centre of Advanced Study in Metallurgy, Banaras Hindu University, Varanasi-221 005.

Conference

The four-day conference was formally inaugurated on the morning of August 30, 1984. It was attended by over 200 delegates from different parts of Asia—over 70 from Japan and 15 each from China and Australia. India was represented by only nine scientists/technologists. The conference provided an important forum for people working in the broad area of electron microscopy to come together, discuss common problems and arrive at plausible solutions.

All the papers at the conference were presented in two parallel sessions - one for physical sciences and the other for biological sciences.

Plenary Lectures

Four plenary lectures were arranged during the conference to give a bird's eye-view of the developments that have taken place in recent times.

The first was by Professor H Hashimoto (Osaka University, Japan) President of IFSEM, who discussed the 'Recent Developments and Future of Atom Resolution Electron Microscopy'. The process of achieving atomic resolution in a transmission electron microscope was succinctly presented by Professor Hashimoto. Following this, he explained the concept of contrast transfer function and showed aesthetically pleasing images of heavy atoms like gold and thorium through dark-field imaging modes. He had also shown a beautiful movie on the observation of vacancies, their clusters and impurity atoms in gold and silicon crystals, respectively. Results of online image processing coupled with a 400 KV analytical atom resolution electron microscope were also presented. Professor Hashimoto has also cautioned that care has to be taken to interpret high-resolution images and that computer simulation can solve some of the problems.

The next plenary lecture was by Professor Gareth Thomas of University of California, Berkeley, USA, who have an overview of the application of transmission electron microscopy to study of inorganic materials. Starting with the explanation of the principal methods in electron microscopy, diffraction and spectroscopy, Professor Thomas explained how materials can be completely characterized with respect to their micro-structure, crystal structure and composition. Selecting examples from steels, electronic materials such as $\text{Cu}_2\text{S}/\text{CuS}$ photovoltaic devices, magnetic materials such as $(\text{Mn}, \text{Zn}) \text{Fe}_2\text{O}_4$ and $\text{Sm}_2(\text{Co}, \text{Fe}, \text{Cu}, \text{Zr})_{17}$ and refractory ceramics for turbines and advanced applications, Professor Thomas discussed how transmission electron microscopy has played a very useful role in solving industrial problems in the laboratory. This lecture also brought home the point that electron microscopy is not just an 'ivory tower' tool but useful in solving down-to-earth practical problems.

Professor S Maruse of Nagoya University, Japan, spoke at great length on the instrumentation aspects of High-Voltage Electron Microscopes (HVEM). After discussing the special features of HVEM's he showed how different operational parameters affect the resolving power and explained the special advantages that can be obtained through analytical and scanning transmission electron microscopy techniques.

Keynote and Invited Lectures

There were ten scientific sessions that followed the plenary lectures and these were spread over two-and-half days. Each Session started with either a keynote lecture (for 40 minutes) or invited lecture (for 30 minutes). One of the keynote lectures was by Professor C N R Rao (Indian Institute of Science, Bangalore) on 'Intergrowth Structures by Means of High Resolution Electron Microscopy (HREM)'. Professor Rao explained, with the help of high-resolution electron micrographs, the different types of structures that can be produced and the way they can be characterized. The other keynote and invited lectures dealt with 'Interfacial Phenomena in Materials', 'Electron Microscopy of Catalysts', 'HREM Studies on Some Oxides and Alloy Phases', 'Diffraction Contrast Using Weak Reflections' and 'Surface Electron Microscopy'. Each of these speakers reviewed the field and presented the latest position as far as their understanding was concerned.

There were some invited papers also and the delegate presented one on 'Electron Microscopy of Rapidly-Quenched Aluminium-Transition Metal Alloys'. He has been engaged in studying the structure and properties of rapidly quenched alloys for the last seventeen years. During the last seven years particular attention was paid to understand the systematics of the formation of metastable phases and their characterization through electron microscopy and diffraction techniques. All the results obtained on binary aluminium alloys containing Pd, Pt, Ru, Rh and Zr in the rapidly-quenched and annealed conditions were summarised and presented. This presentation enabled one to consolidate the results and look for predictive features for the formation of metastable phases in other systems as well.

The delegate had also presented another paper on 'Decomposition behaviour of Vapour-Deposited Al-Zr Alloys'. This was concerned with characterization and formation sequence of two metastable phases Al_6Zr (orthorhombic, $a=0.7489$, $b=0.6556$ and $c=0.8961$ nm) and $\text{Al}_{11}\text{Zr}_2$ (cubic, $a=0.85$ nm).

An important point that emerged from many of the presentations at this Conference was that high-resolution electron microscopy is a very powerful tool to unravel structural details. Banaras Hindu University (Varanasi), Indian Institute of Science (Bangalore) and Sardar Patel University (Vallabh Vidyanagar) are the only three institutions where work on this topic is being carried out. More and more institutions

should take to this type of work. The Chinese group led by Professor K H Kuo (Institute of Metals Research, Academia Sinica, Shenyang) presented several papers on HREM as applied to several alloys and oxides. All the leading manufactures of electron microscopes (Philips, JEOL, Hitachi, Carl Zeiss, Akashi) and accessories (Balzers, EG and G Ortec, Gatan Link Systems, LKB Produkter, Tracor Northern) exhibited their latest equipment near the site of the conference. This provided all the delegates an opportunity to compare the merits and demerits of different equipments.

It was decided at the end of the Conference that these Regional Conferences on Electron Microscopy should be held more regularly. Accordingly, the next conference is scheduled to be held in 1987 either in Bangkok or Hong Kong.

IV INTERNATIONAL SYMPOSIUM ON HYPERTHERMIC ONCOLOGY : A REPORT*

Dr Twisha Lahiri attended the IV International Symposium on Hyperthermic Oncology at Aarhus, Denmark from July 2-6, 1984. The Conference was organized by the Institute of Cancer Research, Aarhus and the Aalborg University Centre. The Scientific Committee was chaired by Dr J Overgaard of Denmark and consisted of fourteen members, 6 from USA, Japan, Germany, France, England and Italy. The sponsors of the conference were the Danish Society for Oncology and Radiotherapy, The Danish Cancer Society, European Society for Hyperthermic Oncology, North American Hyperthermia Group, National Institute of Health, European Society for Therapeutic Radiology and Oncology, etc. The scientific programme of the symposium was aimed at providing a comprehensive presentation of the present status and recent achievements within the biological physical and clinical fields of hyperthermic oncology. There were 550 active participants from all over the world, specially from USA, Europe and Japan.

Hyperthermia has been considered as the fourth modality of cancer therapy either used alone or in combination with radiation and chemotherapy. Despite promising clinical results the full assessment of its possibilities and limitations are yet to be evaluated. Many technological problems remain to be solved. Whereas heating of a superficial tumors is easy, delivery of sufficient heat to deep-seated tumors without simultaneous harmful heating of surrounding tissues is frequently unattainable. Some of the problems with external beams include poor penetration, to directly and difficulty in focussing on medium-sized tumors. Crossfire techniques either with ultrasound or electromagnetic radiation are developed, but adequate systems are not yet available for routine application. Interstitial heating techniques offer interesting possibilities which must now be tested clinically. No one modality is the best for all patients. For each patient we must seek the best solution and the answer is often a combination of systems. For example when whole body hyperthermia does not induce thermotolerance it could be used to raise the temperature to 41°C and then a local heating method could further increase the temperature of the tumor. The most challenging technical problem seemed to be clinical thermodosimetry, and heat quantitation as well as quantitation of normal tissue reactions. It was suggested that extensive worldwide studies are required to

* Based on the delegation report of Dr Twisha Lahiri, Scientist-in-Charge, Department of Endocrinology, Chittaranjan National Cancer Research Centre, Calcutta-700026.

evaluate heat drug interaction methods of heating, and to choose the optimum sequencing and scheduling of hyperthermia and radiation or chemotherapy so that the maximum therapeutic benefit may be obtained.

Several new developments on different areas of Hyperthermic Oncology were presented. These were mainly on the following topics :

Heating techniques :

The developments, advantages and disadvantages of the various heating techniques (a) low frequency RF radiating methods, (b) low frequency RF applicators, (c) microwaves (d) Ultra sound, (e) magnetic loop induction methods were discussed, and it was concluded that the technological expertise for deep regional localised heating by invasive non-perturbing temperature monitor at several points and feed back system to control the temperature is now available. Several instruments in this line has been designed, developed and tested. Developments are being made on line mapping of temperature distribution and computer control synthesis of a desired temperature distribution.

Mechanism of heat injury :

Papers dealing with the effect of heat on cell regulatory systems with special emphasis on hyperthermia induced inhibition of DNA damage and repair, and heat shock proteins. It was shown that the molecular mechanism by which hyperthermia kills cells involves DNA damage resulting from alteration of chromatin structure.

Mechanism of thermo tolerance :

Various regimes of hyperthermia treatments and the developments of cellular thermotolerance both *in vivo* and *in vitro* systems were discussed.

Hyperthermia and radiation :

The potential of local hyperthermia to improve the tumor control rate of conventional radiotherapy was discussed. Both clinical and experimental studies were presented.

Hyperthermia and chemotherapy :

Hyperthermia in combination with chemotherapeutic drugs have been shown to have several unique clinical advantages. (1) Hyperthermia shows synergisms with several anticancer drugs like adriamycin, bleomycin, cyclophosphamide, nitrosoureas and some clinically useful platinum compounds. Hyperthermia was shown to cause potentiation of the cytotoxic action of these drugs offering a targeting effect on the

malignant cells. Therefore, these drugs are active in the tumour areas sparing the normal tissues which was not previously possible. Such a combined therapy substantially reduced the doses of highly toxic chemotherapeutic drugs used in clinical practice. (2) Hyperthermia was shown to have particularly pronounced effect on the central parts of tumours which was nearly inaccessible by radiation and chemotherapy. (3) Hyperthermia was shown to cause very low host toxicity, therefore, the maximum therapeutic benefit could be obtained without additional detrimental effect on normal cells. (4) Hyperthermia was shown to be effective against emerging cell clones resistant to chemotherapeutic drugs a combination treatment therefore greatly increased the therapeutic benefit. It was demonstrated that hyperthermia could be delivered between courses of chemotherapy when leukopenia and thrombopenia prevent the uses of extended chemotherapy and radiotherapy.

Physiological responses of whole body hyperthermia :

The advantages and disadvantages of wholebody hyperthermia, the physiological responses of the host following such treatments, and the effect of such physiological alteration of tumor growth were highlighted.

The delegate's paper was the only presentation from India. In this paper, the results on the studies on intermittent whole body hyperthermia on the systemic and hormonal response of different experimental tumors was presented and discussed. It was demonstrated that in all the experimental groups, following intermittent whole body hyperthermia there was significant enhancement of tumour growth compared to their respective controls, the magnitude of enhancement varied with the tumour type. Stress effects viz. adrenal hypertrophy, thymus involution, lymphocytopenia and elevated corticosteroid levels were evident in all the groups. Maximum enhancement of tumour growth was observed in DMBA induced mammary tumours with a significant elevation of plasma prolactin levels, suggesting a prolactin mediated tumour enhancement following hyperthermia. It was discussed that the stress effects and hormonal alterations are important factors which control and modifies the tumour response to whole body hyperthermia, especially in case of hormone dependent tumours.

Possible impact of the present conference on Indian research work :

Since the biological variance of malignant disease is great the individual treatment which is currently considered optimal is often in contradiction to the systematic clinical trials. The clinician is therefore forced to employ a wide variety of instruments and combined treatment modalities, in an attempt to gain the maximum therapeutic benefit. Hyperthermia either used alone or in combination with radiation, or chemotherapy is one of the treatment that has all possibilities of becoming a very powerful tool in cancer treatment. At the 4th International Conference on Hyperthermic Oncology, in Denmark, all the available knowledge relating to the biologic effects of hyperthermia

and its combination with radiation and chemotherapy has been collected, evaluated, sorted and demonstrated. The possible advantages and disadvantages has been pointed out and discussed, following experimental and clinical trials. The major ground work in this aspect of cancer research has been accomplished.

Unfortunately very little work has been initiated in India in this field. Since successful clinical phase I trials have been reported from various laboratories, there is ample scope for the existing cancer hospital in India to set up hyperthermia treatment units, and utilise the already published experience from other laboratory and start the clinical treatments. Moreover, in view of the therapeutic advantages offered by hyperthermic treatment like low host toxicity selective action on cancer cells, and absence of side effects and the relatively low cost of treatment initiation of such treatment modality finds significance in India. In the research section there is ample opportunity of the various research laboratories to work of heat injury, thermotolerance and physiological responses of the host to local and whole body hyperthermia. Such research is expected yield fundamental information without much additional research expenditure.

INTERNATIONAL SYMPOSIUM ON REMOTE SENSING OF ENVIRONMENT : A REPORT*

The international symposia on Remote Sensing of Environment Forth thematic session "Remote Sensing for Exploration Geology" has been conducted to promote the development and application of remote sensing technology for environmental assessment and to encourage international cooperation in all aspects of this broad multidisciplinary field. The technical programme has been structured to emphasize the use of remote sensing technology in operational settings.

More than forty papers have been addressed by experts in different plenary sessions covering the topics of advanced sensors, application for hydrocarbon exploration, data integration, application for mineral exploration, engineering logistics and marine applications, commercialization of satellite remote sensing programmes of radar systems and applications, geobotanical and environmental applications, phyto-geology and image interpretation and airborne systems and applications. In addition to these about eighty papers have been presented in five poster sessions.

The delegate's research paper entitled "Remote sensing application for locating Bauxite ore 'pats' of the Eastern Ghats of Andhra Pradesh, India utilizing Geobotanical and Environmental data" was presented in poster session C. The studies have been carried out with the aid of standard visual interpretation techniques using handsat imagery and the interpretation is corroborated with topographical map and ground truth. It is observed that not only the specific composition of vegetation but also the ecotypes as revealed by the difference in the morphological expression are the characteristic biota of the pats. The following important points have been raised and discussed by a number of delegates : (a) measures to control mining excavation impact an environment; (b) preservation of any endangered species that may be disturbed due to mining activity; (c) to preserve some ideal part consisting of specific vegetation as 'Biosphere Reserves' as indicators of Bauxite deposits for future generation and (d) a useful discussion was held with Diplex exhibitors on processing technology for image analyses. The company manufactures and innovative line of electronic display systems and image analysis systems and provides extensive software packages to support both image processing and a wide range of applications. The display of the paper has aroused keen interest and generated absorbing discussion especially among the geobotanist delegates of Canada.

* Based on the delegation report of Dr S Sudhakar, Research Scientist, Institute for Coastal and Offshore Research Visakhapatnam-530003.

The main thrust in session eight specified for Geobotanical studies was on exploration, exploitation of geobotanical/mineral indicators. Some of the important papers with the main contents are as follows. In the paper entitled "Geobotany in Canada : Status, Potentials and Programme" the investigators Horler DNH, Horler Information Incorporated, Ottawa, Ontario, Canada reviewed the status of geobotany as it applies to Canada. The planning and early results of a programme to enhance the development, operational use and benefits of geobotanical remote sensing are presented. Attention is also focussed on two advanced sensors whose design and construction were funded by the Government of Canada, the multispectral Electro-optical Imaging Scanner (MELS) and the Fluorescence Line Imager (FLI).

The paper entitled "The use of high resolution spectral reflectance data for Geobotanical Mineral exploration" by Milton N M *et al*, Geological Survey Reston, Virginia demonstrates the presence of heavy minerals in the leaves of plants which were growing in soil over known mineral deposits. Several plant species growing on the mineralised site show differing amounts of metal content, this suggests that some species are better indicators of mineralization than others. The high resolution sensors are expected to lead to an even better capability of discriminating the spectral effects of certain types of mineralization on various plant species.

The other paper entitled "Correlation of metal concentration with Anomalies in narrow band multispectral imagery of the vegetation red reflectance edge, by Miller JR *et al*, York University, Downsview, Ontario, Canada reveals that geobotanical remote sensing investigations at two sites near Red Lake in North Western Ontario. An inverted Gaussian model has been used to describe the red reflectance edge in terms of several parameters that can serve as stress indicators.

In addition to the papers presented by experts in their specialised fields, there were number of interesting poster presentation papers in different fields of remote sensing. Another important aspect of the conference was the number of exhibitors both commercial and noncommercial organization who displayed number of remote sensing product and services. Some of the exhibitors were :

1. DIPIX INC. Columbia, Maryland, USA
2. Earth Observation Satellite Co, Arlington, Virginia, USA
3. National Aeronautics and Space Administration, Washington DC, USA
4. Spot Image Corporation, Washington DC, USA
5. International Imaging Systems, New York, New York, USA

The exposure to the latest technology in computer science is of immense help for better understanding of the remote sensing technology for bioresources programme.

Recommendations/conclusions drawn at the conference :

1. The technological and organizational factors relating to expanding the use of remote sensing for explanation are reviewed and recommendations are proposed for data and information flow from the data gathering service to the end user.
2. High spectral resolution laboratory studies have revealed a wealth of detail in the spectral reflectance of earth surface materials. Work with airborne and spaceborne spectroradiometers have verified that for those materials having diagnostic absorption, features, direct identification can be made through the use of remote sensing.
3. The availability of data from sensors operating in several different wavelength regions has led to the development of new techniques and strategies for both data management and image analysis.
4. Overlying soil containing high concentration of heavy metals show a strong relationship between soil metal content and changes in the spectral reflectance of the vegetation canopies.
5. The integration of data from multiple source requires advanced techniques for data management. A management system is being developed under the pilot land data system (PLDS), a Programme sponsored by the National Aeronautics and Space Administration (NASA) to improve the ability of NASA and NASA sponsored scientists to conduct land related research. This type of management service will greatly improve the capabilities to locate, access, process analysis and interchange remotely sensed and other land science data.
6. Certain problems with regard to identification of species, plant spacing, mutational features, morphological features vis-a-vis their age, vigour, reflectance characteristics, sunlight, moisture conditions, slope aspects etc. and the use of remote sensing techniques in some of these aspects of investigations need to be expeditiously resolved and developed further for its practical utility in the ever increasing search for vital mineral resources especially for developing and mine rich countries like India.
7. The application of visual remote sensing techniques and the use of reflectance characteristics of indicator plants as well as digital analysis techniques for detection of vegetation anomalies offer the potential of rapid survey of large regions and areas effectively. Multi-band aerial photographs can be specially useful in geobotanical surveys. However, still much research has to be conducted to operationally utilise remote sensing techniques for geobotanical surveys. This kind of studies are very pertinent to represent mineral scene of India it demands an urgent survey which is possible only by application of remote sensing.

Major Break-throughs or results reported at the conference

The recordings of the conference manifest the current status and future prospects of the application of remote sensing in exploration mineralogy and new innovative ideas have resulted from the fruitful discussions for expanding remote sensing application in the field of mineral exploration. In addition to the discussion of the results of the investigations carried out through out the world, due emphasis was laid on the very important aspect of the innovative researches on instrumentation and their applicability.

The availability of high resolution spectral reflectance data allows geobotanists to study subtle spectral changes in vegetation that are related to the presence of minerals in the substation. Interpretation of the data from laboratory, field and airborne instruments requires an understanding of the complex interrelationships between leaf reflectance and biochemical factors. Airborne—radiometer experiments demonstrate a correlation between spectral changes in the chlorophyll absorption region in plants and the presence of mineral anomalies in the soil.

Remote sensing for mineral exploration is a technology of great potential economic significance in which geobotany plays an important role.

New airborne and satellite sensors have the potential to provide information of unprecedented detail relating to geological exploration. Attention is focussed on two advanced sensors, the Multispectral Electro-optical Imaging Scanner (MEIS) and the Fluorescence Line Imaging (FLI). Both instruments can record imagery in several narrow, selectable wavebands. The imagery can be processed to provide waveform analysis of critical portions of the target reflectance spectrum. They aid in planning exploration surveys by predicting the effects observable under various conditions and in guiding the selection of sensors and methods and also they assist in analysing project data by providing rationale for the image analysis procedure and by facilitating hypothesis testing.

Possible impact of the present conference on Indian research work.

India has a good subsoil mineral sources i.e. Bauxite, Iron etc , These deposited areas always harbours scanty but specific vegetational community, distributed in various parts of the country. The identification and location of the new areas of ore deposits cannot be carried out manually. Many of the mineral deposited areas in India have remained unexplored and unexploited because these could not be carried out only on the basis of ground survey. This situation can be made easier by the application of Remote Sensing by means of which the mineral deposited areas can be sensed and later confirmed by the grand truth. Moreover the studies are being undertaken

recently in various parts of the world including India to identify specific plant indicator communities and their morphological expressions for a particular mineral.

Certain problems with regard to identification of species, plant spacing mutational features, morphological features vis-a-vis their age, vigour, reflectance characteristics, sunlight, moisture conditions, slop aspects etc. and the use of remote sensing techniques in some of these aspects of investigations need to be expeditiously resolved and developed further for its practical utility in the ever increasing search for vital mineral resources especially for developing countries like India.

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EARTHWORM FARMING IN PHILIPPINES : A REPORT*

Dr Kubra Bano visited Philippines under INSA-NASTP Exchange of Scientists programme (1984-85). The following write-up is based on the report submitted by her. Earthworm culturing was initiated in the Philippines during the year 1977 on a small experimental scale. Engr. Wenceslao Vinzons Tan was the first man to start earthworm raising. He imported earthworms after obtaining an import permit from the Government of Philippines. The earthworms were first brought to Philippines from Taiwan and Japan, and a farm was set up under the name 'Philippine Earthworm Centre'. The Philippine Earthworm Centre (PEC) brought awareness among the Filipinos about the advantages of worm raising through local media and also by circulating handouts and brochures. In a period of two years earthworm farming caught the fancy of Filipinos and a large number of (1000 or even more) wormeries sprouted in the city of Manila, as well as in other cities and provinces. Eventually, during 1979, the earthworm growers gathered and got themselves registered as a body called "Philippine Earthworm Growers Association Inc." (PEGA), for which Mr Tan became the Chairman and President. PEGA started promoting earthworm raising through an educational campaign-conducting meetings, holding lectures, seminars, conventions and also conducting a training programme for those who were unemployed and also trained many technicians in the field. A Government body, Bureau of Animal Industry (BAI), Ministry of Agriculture was also involved and associated with the vermiculture activities of PEC and PEGA.

The first International Convention on Vermiculture was conducted on February 27-28, 1981 under the joint auspices of PEC, PEGA and BAI. The second and third International Conventions were conducted under the above auspices in the subsequent years. In these conventions the invitees were not only the Filipinos, but also a number of foreign scientists who were working on earthworms. Further the BAI, in association with the PEGA and Livestock Association of Philippines, made a Government Programme of Vermiculture under the banner "VERMICULTURE NG BARANGAY" during 1981, for promoting research on vermiculture developing and marketing strategies etc. At this stage vermiculture was also introduced in Universities, such as the Central Luzon State University (CLSU) and University of Philippines, Los Banos, Laguna (UPLB) as well as in the Technology Resource Centre (TRC) etc.

* Based on the delegation report of Dr Kubra Bano, Department of Zoology, College of BS & H, University of Agricultural Sciences, GKVK, Bangalore-560065.

The projects were funded by the Government in all the above centres. Besides this the private organizations as Kilusang Kabuhayan at Kaunlaran (KKK) and private Banks also extended loans to the private earthworm growers. Thus, with all these financial resources, earthworm farming became highly popular. Large and small scale industries came into existence all over the country foreseeing foreign exchange earnings ahead.

In the infant stage, when the earthworms were sold as breeding stock, the wormeries functioned at heavy profits as there were a few earthworm growers. The wormeries sold these breeding stocks at rates as high as p 750/- to p 1000/- per kilogram during the year 1981-82.

During the succeeding years 1982 and 1983 when earthworm farming became a common practice, earthworm growers could produce several kilos of earthworms by providing them with high quality expensive diet. Thus earthworm farming became an expensive affair, and there was a boom in the production of earthworms in the country. At this stage the producers had lost the breeders' market with large stocks on hand, were unable to find a market in their own country or abroad. They were even unable to sell their product for a fraction of the price they paid to obtain the original breeding stock. Thus, the earthworm industrialists faced an over supply and no demand situation in a period of 2-3 years of commencement of breeding. This recession in the market caused a commotion among the growers, and the commodity perished in their own hands, thus collapsing the industry (1982-83 and 1983-84).

Meanwhile the Filipinos tried a lateral approach to the problem and thought that if earthworms were introduced as human food, the growers would be able to recover their investment. With this idea in mind they started formulating recipes incorporating earthworms in small quantities in their traditional dishes, so as to maintain the quality and taste of the dishes. They also went to the extent of incorporating earthworms in a common dish called 'Adobo' and in ham sandwiches.

Though some people tried worms as food, the practice could not be popularised. The Ministry of Food and Agriculture also did not approve of the proposal of using earthworms as human food, although some research data were incorporated into the following theses for the award of MS and BS degrees:-

1. Acceptability of earthworm (*Perionyz excavatus* Perrier) of human food (University Southern Mindanao, Kabacon North Cotabato).
2. The nutritive value and acceptability of earthworm meal as human food (Centre Escolor University, Manila).

3. A study of the utilization of Earthworms cultures in hamburger production (The Philippine women's University). Further, the earthworms as such or as earthworm meal could not be brought to the market as livestock feed due to its heavy cost of production. The production cost of worm meal was prohibitive at \$ 150/- per kg when the cost of fish meal, bone and meat meal, and soyabean meal were \$12, \$10 and \$4 per kilogram respectively. The earthworm growers were not willing to produce worm meal, as 5 kilos of earthworm would hardly yield 1 kilo of worm meal, which turned out to be highly uneconomical. Earthworm product preparations were also not developed. The earthworm industry in Philippines faced an economic crisis and collapsed in the hands of the builders. At present hundreds of trained technicians are jobless.

The major impediments to successful earthworm farming in Philippines were the following ;—

1. Imbalance in the cost-benefit ratio.
2. Lack of planning and strategy in research, development and marketing practices.
3. Earthworms could not be sold as bait for sport of fishing, as this sport was not popular in Philippines.
4. The earthworm growers did not give importance to 'wormcast', which could have saved their wormeries to some extent. This was not thought of due to the availability of fertilizer in the country.

At present, the shortage of fertilizer, due to restricted imports and bad economy of the country has led some private large scale earthworm growers to revive their industries for production of organic fertilizer, the "Vermicompost". They are slowly resuming their culturing practices to meet fertilizer demand of the country. At present wormcast is said to be privately sold for \$ 4-5/ kilo (Manila Earthworm Centre) to horticulturists and ornamental plant growers. Some of the earthworm raisers are using wormcast for their own agricultural farming purposes. Nevertheless, it has not gone to the market and also to the farmers at Philippines.

The Philippine earthworm centre has procured machinery such as worm harvester for worm separation, a sifter to seive wormcast, a grinder to grind worms and a pelletising machine to pelletise worm meal to be used as feed in agriculture. Besides this, the Manila Earthworm Centre has a flake production machine and has produced worm flakes for use as feed for aquarium fishes.

However, earthworm cultivations has not been taken up as a national programme in Philippines though certain other national projects are under operation to meet live

stock feed demands. Some of the other national programmes are cultivation of Ipil Ipil, Soyabean, Azolla, sweet potato, Yellow corn and Cassava. These programmes are said to be viable and farmers are carrying them out. Ipil Ipil is being exported to Japan.

There is a lot of controversy over the subject of recycling of wastes through earthworms. There are doubts about its being a viable proposition. Perhaps it can be tried as a research programme, but the use of worm as livestock feed (worm meal) is most uneconomical, because it cannot compete with fish meal, bone and meat meal and soyabean meal with its high cost of production, although qualitywise it is superior to all the above meals. This has been opined by Dr J E Satchell and Dr Sabina who have commented in their letters addressed to FAO regional office, Bangkok on an article "Vermiculture and animal feed industry" written by Dr Tapiador, which appeared in 'Asian livestock' (March 1981).

According to Dr Satchell and Dr Sabina, unscrupulous commercial practices in management and 'Pyramid selling' are the fraudulent activities which prevailed in Philippines and are spreading to countries like Italy and other European countries. The regional Food and Agriculture Organization Office for the Asia and Pacific, Bangkok has indicated its apprehension that such fraudulent activities may spread to Asian countries, and that these countries may also become the target for unscrupulous international operators. It is also mentioned that legislation has been enacted by the American State Legislatures and also by the Canadian legislature to prohibit such activities.

SHORT COMMUNICATIONS

PROFESSOR R LALITH KUMAR, Mechanical Engineering Department, Indian Institute of Technology, Kharagpur-721302, attended the 26TH MECHANICAL WORKING AND STEEL PROCESSING CONFERENCE of the Iron & Steel Society (USA) at McCormick Center Hotel, Chicago (USA) from October 17-19, 1984. The conference was attended by about 300 delegates from various industries and other organizations. Forty papers were presented by participants from the USA, Canada, Japan, Belgium, India, Italy and West Germany in the following board fields :

- (a) Bar Rod and semifinished products
- (b) Roll technology
- (c) Tubular products
- (d) Flat rolled products
- (e) Detection of defects at elevated temperatures

The delegate presented the paper on 'Centrifugally cast steel for tubular products'. In the USA long steel tubes, pipes, bushings rolls etc. in various sizes are centrifugally cast. Though suitable for mass production the process suffers from two important uncontrollable process variables viz. the mould speed and the mould temperature. Optimum mould speed for a given casting can be obtained experimentally. However, the mould temperatures useful for mould design are difficult to measure due to varying solidification and heat transfer rates. The mean value of the mould temperature is therefore analytically obtained by relating it to the overall heat transfer co-efficient at the mould surface.

The main theme of the conference was on various steel products, their production techniques, properties, inspection etc. The impact on Indian research work can be summarized as follows :

- (i) *Bar, rod, semifinished products and Roll technology* : The study on inclusions in cast products is very relevant to understand the morphology of sulphide as affected by the process technology. Machinability testing for evaluation of continuously cast steel and development of electric resistance heat treated steels and free machining steel were worth noting.

- (ii) *Tubular Products* : The production of seamless tube (Allu roll process) can be economical for possible applications. The production of steel tubes by the centrifugal casting process is improved by analysis of mould speed and mould temperature. By doing so, defect free tubes can be manufactured. The method suggested for horizontal casting of stainless steel and high alloy steel is interesting.
- (iii) *Flat rolled products and detection of defects at temperatures* : The design of thermo-mechanical processes for hot rolling of thick gauge plate steels to get fire grained micro structures and high strength and notch tongheress is a further development. Developing high strength steel plates for pipe fittings economically by normalizing and tempering rather than by quenching is worth considering.

Hot pipe inspection method for inspection of weld after but welding is useful and time saving. Ultrasonic inspection of steel products using lases can feed test information back into the production process to get quality products.

DR V SITARAMAN, Senior Research Officer, National Institute of Nutrition, Hyderabad attended the III EUROPEAN BIOENERGETICS CONFERENCE at Hannover from September, 1984. The III EBEC represented an important transition from the earlier position in the area of biocenergetics as observed at II EBEC. The I EBEC ended on a tentative note that Mitchell's chemiosmotic theory could be valid to explain the mechanism of oxidative phosphorylation. At the II EBEC, Madame Professor Gautheron emphasized various membrane studies of actual and potential importance to bioenergetics, which resulted in a very broad-based and yet an in-depth meeting in bioenergetics. The 2nd EBEC was closed on the note that several exceptions could be found to the Mitchellian thesis, including our own contribution to the confounding effects of centrifugal fields. The III EBEC, organised by the German group, was a highly specialized professional meeting, the scope having been narrowed to an increasing acceptance of Mitchellian hypothesis. The earlier exception to this theory were largely relegated to methodological errors. It appears that several scientists of an anti-Mitchellian stand avoided this meeting.

The meeting itself was characterized by primary emphasis on mitochondrial, photo-synthetic, bacterial and related aspects of bioenergetics. The significant change was that bacterial energeties and transport have gained enormous importance to the extent that detailed sequences of various protein components and their mutants were also presented. Considerable emphasis was placed on reconstitution of various transporters, as also on non-equilibrium thermodynamics.

The increasing emphasis on the mitchellian hypothesis appeared unavoidable since proton AT Passes are now invoked in most aspects of cell biology, including motility in bacteria, and differentiation in the slime mould. The real reason for this emphasis came from the generalization of ion motive force (in contrast to proton motive force of Mitchell) by Skulachev and others. Thus, the Mitchellian hypothesis acquired a most general position in biology, second only to the genetic code. The situation is strange, since the exponential increase in studies on the applicability of Mitchellian hypothesis appears to be countered by significant results to the contrary from several laboratories.

Thus the key round table at the meeting was related to the questions : Is it bulk phase U_H+ or is it the localized proteon gradients responsible for oxidative phosphorylation? In this key debate, among the several experts in the world, it was realized that while bulk phase hypothesis was testable, the localized hypothesis cannot be and that we therefore hardly need newer approaches to bioenergetics.

Against this back ground, the delegate presented two papers at the seminar. The first relates to startling observations that respiration induces variable porosity in the mitochondrial inner membrane. Essentially, it meant that all measurements on $|U_H+$ and its components to date are invalid as also the Mitchellian hypothesis. As a discussant at this key round table, the delegate took the position that not only all these measurements in bioenergetics are primarily in error, but also the actual U_H+ would be too small to account for ATP synthesis. Further, this called for a totally new frame of thinking as to how membranes function. We showed at various round table groups at this meeting that in almost all systems studied, measurements were carried out on the assumption that these systems behave as closed systems, while we could show that all biological membranes truly behave as non-adiabatic systems depending the state of energization. The novel technique of enzyme osmometry (developed in our laboratory) is the only approach now available to measure the nonadiabatic behaviour of biological systems. A few laboratories elsewhere are now expected to use these techniques.

The second paper on the energetic basis of osmotolerance in microbes and drought tolerance in plants relates to the first successful application of bioenergetics. Despite its fundamental importance, bioenergetics, as a discipline, was devoid of application till now. We showed that the assumption of invariable stoichiometry of energy coupling was the single conceptual block limiting the progress in human nutrition (work-calorie relationship in man), biomass conversion efficiency (fermentation technology of microbes) and plant productivity (agriculture). By showing that membrane bound enzymes exhibit a novel property of 'elastic' constant (K) such that the activity

$$A = A_{max} - K II$$

Where Π is the osmotic pressure, we arrived the phenotypic identification of osmotolerance in microbes and drought tolerance in important cultivars like rice, groundnut sorghum etc. in a two dimensional space of osmotolerance or respiration (energy source) and biomass conversion efficiency. This also gave a new method for calculations of maintenance energy against environmental odds.

In summary, the meeting was aimed at consolidation of Mitchellian hypothesis and the application of non-equilibrium thermodynamics to smooth over the embarrassing observations contrary to this hypothesis. The delegates own contributions were against this theme by new methodology, founded in irreversible thermodynamics and not only placed the Mitchellian hypothesis in jeopardy, but also spelt out the errors in the unverified methodological assumptions in membranology. An added bonus was that these considerations were not merely academic, but were central to an important applied, universal, agricultural problem with regard to the identification of the phenotype responsible for drought resistance in important cultivars.

DR J C PAUL, Professor & Head of the Department of Electrical Engineering, Tripura Engineering College, Tripura-799055 attended the CONFERENCE ON ELECTRICAL INSULATION AND DIELECTRIC PHENOMENA (CEIDP) at wilmington Hilton, Clayton D E USA, from October 21-25, 1984. The CEIDP 1984 brought together an international group of researchers, both scientists and engineers, for an interdisciplinary discussion of recent progress in applied and fundamental dielectric sciences and electrical insulation technology. A total of 88 papers were scheduled, with approximately 34% from US, 16% from Japan, 13% from Canada, and the remaining part (37%) from Denmark, Australia, Switzerland, UK, Poland, Federal Republic of Germany, India, Egypt, France, Italy, China, Spain, Taiwan. The following were the technical area covered by the Conference: Partial Discharges; Optical and Polymeric Materials; Degradation in Optical and Polymeric Materials; Insulators, Flashover and Surfaces; Phenomena in Dielectric Fluids; Electrical and Structural Properties of PVD and ZNO; Charge Transport and Structural Effects and Measurements. Pre-breakdown and breakdown phenomena of dielectrics play a significant role on the application of these materials in science and engineering fields. The mechanism of conduction in insulating materials leading to their ultimate electrical breakdown has drawn the interest of a large number of investigators and the results of extensive research work on these aspects have been reported in the past. The range of dielectrics available for use in the fields of science and engineering are wide and the properties of these materials are equally diverse. Apart from the physical and chemical properties there are other innumerable factors that contribute to the dielectric behaviour of insulating materials. The interaction interdependence of these factors are so complex that even a century of research work has not rendered any unified approach to the study of the process of ionization, conduction and breakdown mechanism in dielectric media.

Dielectric materials as used in the field of Science and Engineering are not subjected to electric field alone : quite often they have to work under the influence of both electric and magnetic fields. Considering this in view several work have been reported by the delegate in the past. The present work reported to CEIDP 1984 seeks to document the results of investigations and analysis that were carried out to study the effect of super-imposed magnetic field on the aging of dielectric materials. It may be stated that ageing of dielectric materials has been studied by several researchers under different conditions. The simultaneous application of both an electric and magnetic fields on the behaviour of aging of dielectric materials has not been reported so far. In this paper (reported to CEIDP 1984) the effect of both electric and magnetic fields on the life of dielectric materials (Paraffin solid) in vacuum has been reported and a mathematical model has been presented. It is revealed from the experimental study that life-time of the insulating materials is increased under the simultaneous application of an electric and magnetic field.

The technical programme was started with the presentation of the Whitehead Memorial Lecture. This presentation was made by Dr John Devins, General Electric Corporate Research and Development Centre, Schenectady, New York. The topic he chose was "The Physics of Partial Discharges in Solid Dielectrics".

Of the various special topical sessions, the one on Optical and Polymeric Materials should be singled out. Not only is this the first one suggested and organized by Professor Yahagi from Waseda University, Japan, but it vividly demonstrates how much progress there has been made in extending dielectric techniques to higher and higher frequency ranges. Several decades ago, dielectric work in the range above 100 GHz was highly experimental, without prospect of immediate commercial application.

Effect of magnetic field on dielectric materials in addition to its normal electric field has not been reported much by other scientists earlier. As such lots of interest were taken by other scientists who attended the conference and discussion were made with them. It may be stated that the research works carried out by the delegate may be promising use in future to study the dielectric properties of biological materials. The other relevant areas includes the thawing of cryogenically preserved tissue and the use of pulsed electric and magnetic fields to aid tissue and bone healing. It may be stated that by measuring certain electrical properties of biological materials it may be possible to detect certain diseases and this is very much related to my field of studies on Dielectric materials.

PROFESSOR S V SURYANARAYANA, Physics Department, Osmania University, Hyderabad attended the IX EUROPEAN THERMOPHYSICAL CONFERENCE at Department of Metallurgy, UMIST University of Manchester, Manchester, UK, from

17-21 September, 1984. The European conference on Thermophysical Properties is being held every alternate years, at a location decided by an International Committee. It is mainly sponsored by the Institute of Physics, 47 Belgrave square, London. An International Committee oversees the technical and other arrangements. The members of the committee are drawn from all over the world. The conference was supported by the following organization : (a) British Nuclear Fuels; (b) British Aerospace; (c) The British Council; (d) Pilkington Brothers; (e) The Royal Society; (f) EUARD (USAF) (g) USARD SG (U.S. Army). The talk on "Thermal Protection of the reusable space shuttle" by Dr L Korb (USA) has dealt with aspects of thermal protection system to an economical reusable spacecraft which would require minimum refurbishment between flights. The materials suggested were reinforced carbon carob and silica tiles. The talk by Professor Backstrom (Sweden) was a review on the "Thermophysical properties of solids under pressure". Professor Novikor (USSR) has dealt with the "Melthp lines of simple substances" In addition, there were very good papers on Composites. The delegate presented a paper entitled "Analysis of the data on thermal expansion of some A 15-type intermetallic compounds" (S V Suryanarayana and M Somi Reddy).

(a) The conference felt that in developing countries, some university be chosen to start the centre for thermophysical measurements. There is such need in view of the increased importance for the evaluation of precise data on thermophysical properties, especially on materials of aerospace interest.

(b) It was decided to hold the next ETPC in Italy.

In India there should be a Centre for the study of Thermophysical Properties Research on the lines of TPRC in USA. The centre may have facilities to study thermal expansion, thermal, diffusivity, specific heat, DTA, DSC and other related properties. An impact on the study of composites, fibres and aerospace materials is the need of the hour in the country.

DR P K TIKOO, Reader in Chemistry, Banaras Hindu University, Varanasi attended the IX INTERNATIONAL CONFERENCE ON NON-AQUEOUS SOLUTIONS at University of Pittsburgh, Pittsburgh, USA from August 12-17, 1984. The international conference on non-aqueous solution (ICNAS IX) is held every alternate year. The programme for the 1984 conference included the following topics : (a) Theory of liquids and solutions; (b) Investigation of solute-solvent interactions by spectroscopic and other probes; (c) Transport properties of solutes, particularly at high temperatures and pressures; (d) Non-aqueous battery technology; (e) Kinetic and thermodynamic features of solute reactivity; (f) Synthesis, including homogeneous catalysis and electrocatalysis and (g) Analytical problems in applications of non-aqueous solutions.

As is evident from the program the conference provided an opportunity to have exchange of ideas with not only chemists but also with chemical engineers and technologists. Non-aqueous systems occupy very important position now because of their increased use. Recent researches in these systems have thrown light on the complicated picture of solute-solvent interactions. Organic solvents are being increasingly used in polarographic analysis and they are also used e.g., in construction of thermistors, in catalytic electroreduction processes and in the production of galvanic coatings.

The availability of water as a cheap solvent was responsible to a major degree for the hiatus in the field of research in non-aqueous chemistry. However, there are many processes in which water is not tolerable e.g., electrodeposition of aluminium and other electronegative metals, etc. which are deposited from non-aqueous solvents.

A special high ion source pressure mass spectrometer was utilized to get the free energies, enthalpies and entropies for the stepwise solvation of positive and negative ions with solvent molecules. P Kebarle of Alberta discussed results for H^+ , alkali cations, OH^- , halide anions and several organic ions and solvents like acetonitrile, acetone, dimethylsulfoxide and dimethylformamide. He showed that the free energy enthalpy etc. of ion-solvent molecule equilibria in the gas phase is quite comparable to the solvation, energies in liquid solvents, particularly for quite small solvation number (i.e., $n = 6$ to 8). Therefore, essential differences in ion solvation can be understood on the basis of simple models involving the ion and a few solvent molecules.

The use of radioactive isotopes of ions, of ^{14}C labelled molecules of solvents and of tritiated water was shown to be quite helpful in tracing the migration of individual components in a mixed electrolyte solution. M Chemla of University Pierre et Marie Curie, France, discussed the important conclusions in a plenary lecture 'Influence of preferential solvation on transport properties of electrolytes in mixed-solvent solutions'. Different kinds of experimental devices were perfected in order to determine the fluxes of each radioactive component under several mechanisms, such as self-diffusion, mutual diffusion, ionic mobility under electric field, solvent drag by ions migration, etc.

The delegate contributed two papers, namely: (a) 'Studies on Ion-solvent interaction through viscosity measurements. Potassium halides in N, N-Dimethyl formamide-water mixtures'. And (b) 'Effect of change of solvent composition on the physical characteristics of Nickel electro-deposited from Amid water mixtures'. The first paper deal with the viscosity measurements in the mixed solvent system. The viscosity results provide an insight into the solute-solvent and solvent-solvent interactions. The understanding of these interactions are of immense help in developing a model for the structure of the system in view of the fact that the processes at the electrode-electrolyte interface are dependent on these interactions and the application of electrode-electrolyte interface is manifold.

The second paper was about the new baths used for nickel electrodeposition. The Amid/water mixtures baths were chosen with a view of relating the change in the characteristics of nickel electrodeposit with the change in the solution properties. The study of the solution properties of mixed solvents complements the electrodeposition studies.

The enrichment in experience and ideas through attending the conference will help in planning newer experiment. Our country has realized the importance of acquiring the scientific and technical know-how and is trying to keep abreast with the developments elsewhere and this conference serves the purpose adequately.

DR SALIL BOSE of Madurai University, Madurai attended the GORDEN CONFERENCE ON BIOCHEMICAL EFFECTS at Hampshire, USA from August 1984. The conference had two sessions each day, one in the morning and one in the evening and two poster viewing sessions, one in the morning and one in the afternoon. In each session there were two formal presentations each of 30 min duration, and the rest of the time was devoted in discussion by the discussants and participants. There were thirty discussants and seventy invited participants. Each discussant and participant was allowed to present a poster during the poster viewing session which was further discussed in the following evening session.

There were eight topics discussed in the conference. These were : membrane structure-molecular aspects, membrane structure-supra molecular aspects, proton gradients, energy coupling and photophosphorylation, coupling factors, photosystem II and O_2 evolution, electron transfer and Q cycles, and regulation of thylakoid functions. There were no overlapping sessions so that everybody could take part in discussion of each session. The delegate presented a poster (Mg^{2+} prevents back reaction of photosystem II charge separation) on August 22. The role of Mg^{2+} in the primary photochemistry of photosystem II has been suggested by various workers (including the delegate) for quite sometime, but in this conference the delegate indicated from his experimental results a possible nature of the role of Mg^{2+} . He showed by theoretical analysis of oxygen flash yields that Mg^{2+} appears to prevent the back reaction of charge separation occurring in the photosystem II. The exact mechanism of prevention of back reaction is however yet to be elucidated. During the discussion in the evening session Dr Jim Barber (Imperial College, London) commented that Mg^{2+} (and probably other cations) stabilize the charge separation at PS II possibly through ionic interaction with the proteins in the PS II complex. During the next few years very active research should be/will be continued to characterize and reconstitute the O_2 evolving complex (OEC). Many laboratories have been working on this aspect, but the results as presented in the conference were almost always contradictory. Characterization of the proteins of the OEC, their nature of association with pigments

and ions (Mn, Mg, Ca and Cl), their role in O₂ evolution, etc, should be worked out. Emphasis should be given on the reproducibility of results between workers. This aspect is very much lacking in this field at this moment. The other aspect of photosynthesis research that will be dominating during the next decades or more is the molecular biology of the photosynthetic apparatus. The main objective will be to identify the genes encoding the functional and structural protein components of the photosynthetic apparatus and the regulation of their expression.

PROFESSOR P S RAO, Head, Plant Biotechnology Section, Bhabha Atomic Research Centre, Bombay visited China Academia Sinica under the INSA Exchange Programme. He participated in the FIRST INTERNATIONAL SYMPOSIUM ON GENETIC MANIPULATION IN CROPS AND III INTERNATIONAL SYMPOSIUM ON HAPLOIDY and visited the following institutes :

1. Institute of Genetics, Beijing
(Professor Hu Han Dr Shao Qiquan Dr Lu Deyang)
2. Institute of Botany, Beijing
(Professor Wang Fu-Hsiung, Professor Chien Ying-Chien Professor Kuang Tingyun)
3. Chinese Academy of Agricultural Sciences, Beijing
(Dr Dong Yushen, Professor Yue Dahua)
4. Shanghai Institute of Plant Physiology, Shanghai
(Professor Loo Shih-Wei, Dr Wang Tian-duo)

China has made rapid advances in Agriculture using plant tissue culture technology. Utilizing anther culture as a tool several new varieties of wheat and rice have been released. A winter variety of wheat named Jinghua No. 1 is a high yielding variety resistant to leaf and stem rust. Anther culture 28 is another disease-resistant variety. The average yield for over six generations was over 6000 kg/ha. Several varieties of rice (Hua Ju No. 1, Hua Ju No. 2, Huayu 15 and Hua Han Zao Xin Xion) have all been derived from anther culture. Huayu 15 yields more than 7.8 t/ha. Hua Han Zao is grown in 7 million hectares of land spread over 14 provinces and 200 countries. It is early maturing with stable yields and is tolerant to cold temperature.

Rapid clonal multiplication of ornamentals has been taken up vigorously. The Beijing Institute of Ornamental Plant Research has produced and sold out thousands of plants Middendorf Day lily. Similarly the Shanghai Institute of Ornamental Plants Research and Shenyang Institute has succeeded in propagating dozens of lily genera, *Gladiolus*, *Carnations*, *Cymbidiums*, orchids etc.

Micropropagation of elite trees of Poplar, *Eucalyptus* has been successfully carried out. Some endangered tree species such as Chinese red wood and Chenafir have also been rescued and propagated through tissue culture.

Production of virus-free potatoes has also been accomplished. Using shoot tip culture technique one hundred varieties of virus-free potatoes were released and their performance was assessed and found excellent in 25 out of 29 provinces in China.

In the field of protoplast culture and somatic hybridization, plant regeneration from protoplasts of several economically important plants has been established and several tobacco hybrids have been obtained through protoplast fusion.

Plant genetic engineering is another area which is given considerable attention. Using Ti plasmids, Chinese scientists have been able to transform mustard (*Brassica oleracea*) callus and obtain several transformed plants of mustard.

PROFESSOR I C PANDE, FNA, 16A Kalidas Road, Dehra Dun-248001 (UP) attended the XXVII INTERNATIONAL GEOLOGICAL CONGRESS (IGC) held at Moscow (USSR), for the third time, from 4 August, 1984. The delegate attended the Congress as a leader of INSA delegation. The IGC was mooted out at Philadelphia (1876) and the "Organizing Committee of International Congress" was established in 1878 in Paris. Earlier the IGC used to be held after every third year, but, since 1929, the interval between each congress has been four years. In 1961, International Union of Geological Sciences (IUGS) was created to coordinate the activities of geologist during IGC sessions.

The congress was represented by 110 countries and 5845 geoscientist were registered. The majority of the delegates, 2586 and 343, were from USSR and USA respectively. About 70 delegates from India attended the congress. INSA sponsored a delegation of 20 geoscientist of whom only 12 attended the congress. The subject matter had been suitably divided into 22 sections. In addition to 6 colloquia and 10 symposia, of particular interest, reviewing recent achievements in geosciences and geological aspects of environmental projections were held. A few special joint symposia on special subject, like uranium, were also held.

Scientific sessions were held at two widely separated places i.e. at Sovincentre and Moscow State University. Although there was regular bus service, connecting these places, yet it has been rather difficult to switch back and forth to attend all the papers of particular interest.

The opening ceremony of the congress was held at Kremlin Palace of Congress. Professor E A Kozlovsky, Minister of Geology (USSR) and the President of the

Congress, address the assembly and called for new models, instruments and mineral exploration techniques and determination of world's mineral resources. He also stressed on the need for ground water exploration, environmental protection and better understanding of Geological hazards. This was followed by a welcome address by Professor J Aubouin, President XXVI IGC (Paris 1980). The other speakers who also spoke at the ceremony were Professor B M Zubarev, Deputy Minister, Geology (USSR), Professor E Scibold, President IUGS and Dr N A Bagdanov, Secretary General XXVII IGC.

A large number of papers were presented during the congress. About 60 papers were presented by the Indian delegates. Professor Pande contributed a paper entitled "Deep Fracture Tectonics Vis-a-Vis N.W. Himalaya". It has been published in 'Abstracts' Vol. IX Pt II of the IGC. The papers largely attended were on tectonics, structure of earth's crust, stratigraphy and economic geology. Symposia on Recent Advances in geology, Precambrian Metallogeny, tectonics of folded belts were the main centres of attraction. Significant contributions were made by Professor A L Yanshin, Professor G D Ashgerie, Dr V V Balousov, Professor S I Sherman, Dr J Stoeklin etc. These have opened a new vista on the geology of folded belts of Asia, especially the Himalaya.

Professor K S Valdiya, K B Powar, S Sinha Roy, R K Varma, Surbshri Ranga Rao, D K Pande and others presented their reports. The papers were of high quality, especially the papers read by Professor Valdiya and Professor Powar from universities and Shri D K Pande from ONGC. Shri Pande spoke on "Source bed history of Bombay High off-shore region". The paper received high appreciation and has been also published as a Pre-congress Volume. This paper has opened a new technique in oil exploration.

One of the noticeable feature of the congress has been a number of business meeting of societies and group affiliated to IUGS and IGS. The VII ordinary session of the IUGS was held during the congress. Changes of office bearers in various committees were recorded. New members of the council were elected. Shri S K Mukerjee, Director-General, Geological Survey of India, was elected as one of the Vice-Presidents of INGS Council. Algeria, Belize, Burundi, Ecuador, Jamaica and upper Volta were admitted as new members of the union.

It has been noted with great satisfaction the ever broadening and highly significant role that the geosciences are now playing around the world in social development and solving global problem of water supply, natural calamities, environmental protection, pollution etc. The XXVII IGC has laid strong stress on the need of International Cooperation in the field of geosciences : common programs aimed at solving some urgent social and economic problems, with greater understanding of the global

problems. It has been also proposed to find ways and means for locating and exploration of minerals for the use of man kind. The congress has served as a source for new inspiration to the Indian delegates, who have benefited by attending sessions of their interest.

PROFESSOR S S BIR, Department of Botany, Panjabi University, Patiala, from 3-28 September, 1984 under INSA-Royal Society Exchange Programme.

The herbaria at British Museum London and Royal Botanical Gardens at Kew and Edinburgh store invaluable Asian material collected by early botanists. Lecto and isotypes of several Indian ferns are available here in addition to well authenticated collections. Linnean specimens are available with Linnean Society London. For any meaningful taxonomic account of the Indian ferns, it is essential to consult these herbaria.

During the period of visit to various institutions in UK doubtful matters concerning the identity of several Asplenioid and Athyrioid ferns were clarified especially in case of *Asplenium laciniatum*, *A. varians*, *Athyrium filixfemina*, *Diplazium polypodioides*, *D. asperum*, etc. An inventory of materials of Asplenioid and Athyrioid ferns examination of the specimens.

Visits to Leeds and New Castle enabled to consult specimens collected by Dr W A Slege and Dr T G Walker from tropical regions. Particularly, materials of *Asplenium unilaterale* complex were examined and position of Indian materials clarified. Libraries at these institutions hold invaluable collections of classical Taxonomic literature.

In the procurement of xerox copies of fern literature concerning Himalayan ferns an invaluable help was provided by Dr B M Wadhwa, Liaison Officer, Botanical Survey of India, at Kew Gardens. Photographs of the herbarium specimens were taken for reference in future work.

Discussions with contact persons centred around cytological evolution in Temperate and Tropical Pteridophytes, infraspecific classification in light of cytomorphological data and the taxonomy of Asian members particularly the Asplenioid and Athyrioid ferns.

RAMASWAMY RAJARAM, Associate Professor, Indian Institute of Geomagnetism, Colaba, Bombay visited Japan under INSA-JSPS Exchange Programme. The major part of the work was at Geophysical Institute of the Kyoto University to familiarize

oneself with fabrication and testing of balloon electric field pay loads and finalize data reduction plan for joint balloon experiment. In addition, he also visited the following institutes : (a) Geological Survey of Japan, Tsukuba (Dr Murakami); (b) Meteorological Research Institute, Tsukuba (Dr Koderu); (c) Scientific Balloon Launching Centre, Institute of Space and Astronautical Science, Sanrico-Cho (Dr Yutaka Koma); (d) Institute for space and Astronautical Science, Tokyo (Professor Tsuruda and Dr Yukaka Koma); (e) Meissi Electrical Company, Mori Kakioka Magnetic Observatory (Professor Tsuruda and Dr Harada) and (f) Tokyo University (Professor Oguti).

Balloon borne techniques for monitoring the horizontal component of the electric field are extremely difficult and have not been attempted in India so far. The exposure to the intricacies of the technique of fabrication and testing and the experience gained through experimentation on the data collected earlier (in another flight) would help the scientist to under take the effort independently in the country exposure to ground based techniques of monitoring the electric field especially those associated with pollution and seismic activity will also prove useful.

The delegate also presented a seminar at the Geophysical Institute on 'Low latitude Magnetic Variations and the Importance of Monitoring the Horizontal Electric Field on board the Balloon.' An instrument was designed for continuously monitoring the altitude on board the balloon and the entire payload was assembled and made ready for despatch.

DR S D RINDANI, Department of Theoretical Physics, University of Madras, was delegated to attend the XXII INTERNATIONAL CONFERENCE ON HIGH ENERGY PHYSICS held at Leipzig from July 19-25, 1984. The conference, a biennial affair was organized by the International Union of Pure and Applied Physics, and was held at the Karl Max University. It was attended by over 1000 delegates from different countries. The conference was organized into parallel sessions (July 19-22) and plenary sessions (July 23-25). The parallel sessions were intended to report on different topics under which papers were contributed to the conference. At the plenary sessions, important topics of current interest were reviewed by invited speakers. Some of the topics of most general interest were proton decay experiments, results at the CERN pp collider experiments, discovery of new particles, and the status of gauge theories. At the experimental level the results reported and reviewed at the conference were encouraging for the continuation of experiments already in progress and gave further support to the dominant current theories in which gauge interactions play an important part. At the theoretical level, while perturbation theory analysis of interactions continued to play an important role, there was renewed interest seen in non-perturbative aspects of field theory. Supersymmetry and supergravity, and theories in higher dimensions are also of growing interest. A significant event was a talk

on higher-dimensional theories (Kaluza—Klein theories) by the Nobel laureate Professor Abdus Salam.

The delegate, in six papers contributed to the conference, represented his work in collaboration with other members of the Department of Theoretical Physics, University of Madras. The papers dealt with two-photon physics and with tests of a model with fractionally-charged quarks. The work on two-photon physics consisted of a critique of the standard equivalent-photon approximation for the production of vector particles, and gave an alternate scheme of approximation. Tests of the integer-charge quark model in e^+e^- and pp experiments and in the decay of weak vector bosons were discussed in other papers.

The most eagerly awaited results in the conference were those on the experiments at the pp collider in CERN, Geneva, carried out by a large European collaboration. The UA1 group working in CERN announced the discovery of a new variety of quark, called the "top" quark, in the decay of the recently discovered W boson (It may be recalled that the 1984 Nobel Prize in Physics was awarded for the discovery of the W and Z bosons). Though the existence of the top quark had been conjectured on theoretical grounds for a long time, its mass could not be predicted decisively. If the top quark is confirmed by future more elaborate experiments, it would be a most important discovery. The UA1 and UA2 groups at CERN reported certain new types of configurations in their experiments which have been interpreted as evidence for supersymmetric theories.

Another exciting result was the discovery of a new long lived resonance called at 8.3 GeV in the radiative decay of a heavy particle called Υ . This discovery was made by the Crystal Ball collaboration working at DESY, Hamburg. This resonance was conjectured to be a Higgs-particle, a spin-zero particle postulated in a unified gauge theory of electromagnetic and weak interactions. But the experimental result did not support the possibility that it was a Higgs particle in the simplest of unified theories; the theory would need to be more involved. Latest results of experimental work on proton decay being carried out by a team of Indian and Japanese physicists at the Kolar Gold Fields was reported by Prof V S Narasimham of TIFR, Bombay. It may be recalled that the group working at Kolar was the first to announce results on proton decay experiments. Subsequently, several other groups in various countries have reported their results on proton decay experiments and the Indian experiment continues to make observations. Professor V S Singh spoke on "Fractional charge for fermions", a topic of great current theoretical interest. Several other Indian physicists also participated in the conference. They had the opportunity to discuss their work and ideas with other physicists from different parts of the world, and could benefit from new ideas and trends learnt at the conference.

DR RAVI MEHROTRA, Scientist C, E & E Standards, National Physical Laboratory, New Delhi, attended the XVII INTERNATIONAL CONFERENCE ON LOW TEMPERATURE PHYSICS at Karlsruhe, West Germany, from 15-22 August. The LT-17 Conference, which is held every three years, was attended by over twelve hundred people this time. It covered almost all current topics in low temperature physics. The highlights included plenary sessions on the Quantum Hall Effect, applications of SQUID sensors to biomagnetism, and melting phenomena in two dimensions. Of special interest were invited talks on recent results and efforts in the area of electrons at helium surfaces, roughening transition and crystal growth in ^4He , ^4He as a dilute Bose gas, evaporation of ^4He , and search for magnetic monopoles.

The delegate presented two papers at the conference in oral sessions. The titles of the papers were "Possible Correlation Effects in the Density Dependent Mobility of a Two Dimensional Electron Fluid" and "Second sound Damping near the Line of ^4He ". The results on the delegates recent preliminary calculations of the viscosity of a 20 electron liquid were also presented. These calculations may be able to explain the experimental results presented. There was a lot of interest generated by these calculations which show that the electron liquid behaves like a semi-glass in two dimensions. In the second talk the results of very precise measurements of the second sound damping have motivated theorists to look at their theoretical predictions more closely in order to explain the discrepancies that have been revealed between the experiment and theory.

The delegate also held discussions with many scientists at the conference regarding long range order in two dimensions. In particular, the possibility of modifying many theoretical calculations to take into account the exact form of the structure factor, which has power law divergences in a two dimensional solid was explored. This has not been done so far. He also plans to work on Monte Carlo simulations of a quasi 10 electron system to look at fluctuations as a function of dimensionality and other properties.

A technical visit was made to Technische Universitat, Munchen to study the experimental facilities in the area of Quantum Hall Effect there. This study would help to plan the efforts in this area at NPL better. It was possible to formulate some ideas on some signal recovery techniques for Quantum Hall Effect which may possibly be better.

Forthcoming Seminars/Symposia/Conferences etc.

IUPAC sponsored International Conference on Organic Chemistry of Medicinal Natural Products at Shanghai, China from November 10-13, 1985.

IAU sponsored International Conference on History of Oriental Astronomy at New Delhi, India from November 14-17, 1985

IX General Assembly of IAU at New Delhi, India from November 19-28, 1985.

IAU sponsored International Symposium on Astrochemistry at Bombay, India, December 2-5, 1985.

IUCr sponsored School of Direct Methods, Macromolecular Crystallography and Crystallographic Statistics at Madras, India from December 9-19, 1985.

IAVCEI/IUGG sponsored International Volcanological Congress at Auckland, New Zealand from February 1-9, 1986.

CODATA sponsored Workshop on Standardization of Environmental Data at Toronto, Canada in May 1986.

IUIS sponsored VI International Congress of Immunology at Toronto, Canada from July 6-88, 1986.

IUBS sponsored International Conference on Differentiation Patterns in Higher Plants at Zurich, Switzerland from July 13-18, 1986.

XXX International Conference of IUPS at Vancouver, Canada from July 13-19, 1986.

X International CODATA Conference at Ottawa, Canada from July 14-18, 1986.

XV General Assembly of CODATA at Ottawa, Canada from July 18-19, 1986.

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